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# Graduate, Undergraduate, *and* Non-Academic Courses

1964-1965



GRADUATE SCHOOL

UNITED STATES DEPARTMENT  
OF AGRICULTURE

EDUCATION FOR FEDERAL EMPLOYEES

U. S. DEPT. OF AGRICULTURE  
WASHINGTON, D. C. 20250

JAN 11 1965

CURRENT SERIAL RECORDS

# Calendar for 1964—1965

## FALL SEMESTER

Sept. 5–12	Registration (Late fee charged after Sept. 12)
Sept. 14–18	Classes begin
Sept. 25	Last day of registration for credit
	Last day of course transfer without late fee
Oct. 9	Deferred payments due
Oct. 23	Deadline for credit—audit change
Nov. 11	Veterans Day—no classes
Nov. 26	Thanksgiving Day—no classes
Dec. 24–Jan. 3	Christmas holidays—no classes
Jan. 4	Classes resume
Jan. 15	Close of fall semester *

## SPRING SEMESTER

Jan. 23–30	Registration (Late fee charged after Jan. 30)
Feb. 1–5	Classes begin
Feb. 12	Last day of registration for credit
	Last day of course transfer without late fee
Feb. 22	George Washington's Birthday—no classes
Feb. 26	Deferred payments due
Mar. 12	Deadline for credit—audit change
May 21	Close of spring semester *

## SUMMER SESSION

May 22–May 29	Registration (Late fee charged after May 29)
June 1–4	Classes begin
June 4	Last day of registration for credit
	Last day of course transfer without late fee
June 11	Deferred payments due
June 18	Deadline for credit—audit change
July 5	Holiday for Independence Day—no classes
August 6	Close of summer session *

\* Class meetings that are missed for any reason will be made up. Classes are not held on days when Government offices are closed early or all day due to hazardous weather conditions.



# CATALOG

*of the* GRADUATE SCHOOL *of the*  
UNITED STATES DEPARTMENT OF  
AGRICULTURE



FALL—SPRING—SUMMER

1964-65

*Please keep this catalog for use in the  
Spring and Summer*

This Catalog, published annually by the Graduate School, contains the graduate and undergraduate programs for the fall and spring semesters and the summer session. The right is reserved to make changes in the course offerings as circumstances require. Bulletins on correspondence study and special programs are available upon request.

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# UNITED STATES DEPARTMENT OF AGRICULTURE

ORVILLE L. FREEMAN, *Secretary of Agriculture*

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# General Information

## PURPOSE OF THE SCHOOL

The objective of the Graduate School of the United States Department of Agriculture has always been to improve the Federal Service by providing needed educational opportunities for Federal employees. The Graduate School has six main programs: resident evening, special, correspondence, international, public lectures, and the press. Graduate study is a primary interest of the School, but it also offers a large number of undergraduate as well as non-credit courses. All courses are open to qualified employees of the Federal Government and to other qualified persons as facilities permit.

## FOUNDING OF THE SCHOOL

The statute that established the Department of Agriculture in 1862 gave it the responsibility to "disseminate agricultural information in the broadest sense of the word." From the beginning, employees of the Department were educators. It soon became apparent that they needed opportunity to continue their education while working.

The Secretary of Agriculture expressed in 1898 the need of the Department for an organization such as the Graduate School. There was special need for continuing education for young scientists doing research in the Department. No action was taken at that time. However, shortly after the First World War, when the demand for qualified personnel became acute throughout the Federal Government, the Congressional Joint Committee on the Reclassification of Salaries recommended that the departments of the Government give more attention to the development of opportunities within the Federal Service for the continuing education of their employees. Accordingly, the Secretary of Agriculture appointed in 1920 a special committee to explore the matter. After consideration of the findings of the committee and after consultation with leading educational institutions and other government departments and agencies, the Secretary established the Graduate School in 1921. He said at that time: "I believe those who may be able to avail themselves of this opportunity will both enrich themselves and enhance the value of the service they render."

## ACCREDITED STANDING

The Graduate School does not grant degrees and has never sought that authority. It prefers to give courses of standard graduate and undergraduate quality, to assure that quality through the competence of its instructors, and to cooperate with the degree-granting institutions. A student should consult *in advance* of registration with the college or university from which he wishes to receive academic credit for courses taken in the Graduate School.

The United States Civil Service Commission accepts the credits of the Graduate School, for examination and qualification purposes, on the same basis as those from accredited colleges and universities.

## ADMINISTRATION

The government of the Graduate School is vested in a General Administration Board appointed by the Secretary of Agriculture. The functions of this Board are similar to those of a board of trustees of a college or university. The School is administered by a director and a small administrative staff. It is nonprofit and receives no Federal funds.



The resident evening program in Washington is organized into eight departments. Each department is directed by a departmental committee composed of a chairman and members of recognized competence in a particular field. The committees organize and give general administrative direction to the curricula of the departments. Some departments are divided into smaller academic areas and are directed by subcommittees subject to the approval of the departmental committee. There is also a Special Program Committee to advise on offerings designed for particular needs of departments and agencies of the Federal Government. The eight departmental chairmen, together with the chairmen of the Special Program and Correspondence Committees make up the Council of the Graduate School. The Director serves as chairman. Similar committees direct other activities.

#### TEACHING

The faculty of the Graduate School is recruited mainly from scholars employed in the Federal Service. Most faculty members have taught in the colleges and universities in the United States and abroad before joining the Federal Government. They want to maintain academic contacts and like to teach. Thus they are attracted to the Graduate School. Because their positions in the Federal Government relate closely to the subjects they teach in the evening, they bring a fresh academic point of view and a practical approach to the classroom.

#### LIBRARY RESOURCES

The student body of the Graduate School has access to the noted library facilities in the capitol of the United States. There is a large library in the Department of Agriculture, containing more than one million volumes on agriculture and other subjects. Supplementing the Department Library is a collection of books supplied by the Graduate School. In addition, students can draw upon the rich storehouses of the Library of Congress, the Smithsonian Institution, the National Archives, and other exceptional special libraries.

#### CERTIFIED STATEMENTS OF ACCOMPLISHMENT

Certified statements of accomplishment are offered in accounting, administrative procedures, editorial practices, financial management, library techniques, meteorology, natural history field studies, oceanography, public administration, statistics, and surveying and mapping. A student interested in working toward a certified statement of accomplishment in any of these fields should plan his proposed course of study with the Registrar. The requirements for each statement are listed under the appropriate Department in this volume.

The certified statement of accomplishment is offered to encourage the student to complete a well-rounded program in his chosen field of study. Each student who receives a certified statement is also given a transcript of his record. This is useful as public evidence of qualification. At the request of the student, an official transcript is sent to the institution or agency designated by him.

# Regulations and Procedures

## ADMISSION

All qualified employees of the Federal Government and other qualified persons are eligible to be admitted to resident and correspondence courses in the Graduate School.

## ENTRANCE REQUIREMENTS

The Graduate School does not offer degree programs. Consequently the requirements for entrance depend upon the level of the course for which the student is registering.

Undergraduate courses are open to graduates of a standard high school or to persons who have demonstrated that they have achieved an equivalent educational level. For admission to more advanced courses, college work in the same or related field is presumed. Specific prerequisites are stated for admission to many courses. A student is expected to have completed the first semester of a year course before he may register for the second semester.

## FEDERAL TRAINING LEGISLATION

Under the authority of the Government Employees Training Act (Public Law 85-507), Federal departments and agencies have authority to pay for training of employees in non-Government facilities when training is necessary and not reasonably available within Government. By training is meant "the provision of opportunities to acquire skill or knowledge related to the work of the respective Federal agencies." The Graduate School is a non-Federal facility, and, through contractual arrangements, the tuition fees and related expenses of a Federal employee can be paid by his agency. The student should make these arrangements with his supervisor or personnel office in *advance* of registration.

## VETERANS

Graduate School resident evening courses are available to veterans under the provisions of Public Law 550. Registration for part-time study is charged against educational benefits only in the proportion that the number of semester hours bears to a full normal load.

A veteran who is re-entering the Graduate School classes after an interruption of training, or who is entering the Graduate School for the first time, is advised to consult the Registrar in *advance* of registration so that approval of a program can be obtained from the Veterans Administration.

## SCHOLARSHIPS

The Graduate School offers scholarships each semester, in the form of free tuition for one course, to the principal participants in the interdepartmental management intern program operated by the United States Civil Service Commission. There is also available a limited number of course scholarships for qualified Federal and District Government employees. Application for these scholarships should be made before May 15 to the personnel offices of the Federal departments and agencies. The recipients are selected by the Scholarship Committee of the Graduate School from the nominations made by the agencies.

## COUNSELING SERVICES

Officers of the Graduate School are available throughout the registration periods and from 9:00 a.m. to 5:00 p.m. each weekday for counseling on educational plans in the Graduate School, or elsewhere. An educational and vocational testing and counseling service is available upon the payment of a fee. Appointments for this service are made in advance.

## TRANSFER OF ACADEMIC CREDIT

A student cannot assume that academic credit for work done at the Graduate School will be accepted by any particular college or university. Such credit is generally granted on the basis of the individual courses taken, the over-all program of the student, and the quality of the work done by the student.

A student who wishes to take an advanced degree should consult in *advance* the dean of the graduate school of the university in which he wants to become a candidate for a degree. He should obtain approval in *advance* for any courses in the Graduate School that he wants to use toward his degree. The student who is deficient in basic undergraduate courses required before undertaking graduate work can find many such courses in the large undergraduate program of the Graduate School. Others are available in the local colleges and universities.

A student who is interested in working toward an undergraduate degree should similarly consult in *advance* the dean of the institution from which he hopes to receive the degree if he wishes credit for work taken at the Graduate School.

## REGISTRATION

The registration period for each semester is shown on the calendar on the inside front cover. A late fee for each course is charged for registration after the opening of the semester. After the second week of classes in the fall and spring semesters, and after the first week in the summer session, a student may register for credit only with the approval of the instructor and the Registrar. Registration is not completed until the required fees have been paid.

## COURSE LOAD

A student who is employed full time may carry more than two courses only with the permission of the Registrar.

## FEES

*Course Fees.* The tuition charge is in general \$14.00 for each semester hour credit.

*Late Fees.* A fee of \$2.00 for each course is charged for late registration. A fee of \$1.00 for each course is charged for late transfer.

*Reinstatement Fees.* A fee of \$2.00 for each course is charged for reinstatement to the student who fails to meet payments when due, in addition to all accrued fees.

*Laboratory Fees.* Laboratory or materials fees are listed in the *Schedule of Classes* for each semester, in connection with the courses for which they are charged.

*Service Fee.* A fee of \$1.00 for each course is charged the student using the deferred payment plan.

*Transcript Fee.* A fee of \$1.00 is charged for each copy of a student record on the regular Graduate School form or on the form of another institution or state board of education.

These are current fees and are subject to change.



Fees are due and payable in advance at the time of registration. Registration is not completed, and no student is permitted to attend classes until all fees have been paid.

An arrangement can be made at the time of registration for payment of fees in two installments, one half and a service fee at the time of registration, and the balance by the end of the fourth week in the fall and spring semesters, and by the end of the second week in the summer session. After the first two weeks of classes, fees must be paid in full at the time of registration.

A student who fails to meet payments when due will be suspended and may not attend classes until he has been reinstated and has paid all accrued fees as well as a reinstatement charge of \$2.00 for each course.

All fees are payable at the Business Office, Room 1031, South Building, U. S. Department of Agriculture, Washington, D. C. 20250.

#### FEDERAL INCOME TAX DEDUCTIONS

In accordance with an Internal Revenue Service regulation of April 5, 1958, expenses for education are deductible if they are undertaken for the purpose of "maintaining or improving skills by the taxpayer in his employment." This regulation is in many instances applicable to courses taken in the Graduate School.

#### ATTENDANCE AT CLASSES

Students are expected to attend all meetings of classes and not to be absent without adequate reason.

Absence does not relieve the student from responsibility for work required while he was absent, and the burden of proof that the work has been done rests with the student. In courses in which the work cannot be satisfactorily tested by written examination, the instructor shall be the judge of the relation of the student's attendance or nonattendance to his grade. A student registered for credit who is absent more than 25 per cent of the class periods receives a mark of "W," withdrawn, unless he makes up all required work. Auditors who are absent more than 25 per cent of the class periods receive the mark of "W."

#### CREDIT AND GRADES

*Academic Credit.* The student registering for academic credit must satisfy all prerequisites for admission to the course as generally stated, or as specified in the course description.

*Audit.* An auditor must meet the same prerequisites as a credit student. He receives full privileges of class participation if he chooses to exercise them. An auditor does not receive a grade. He receives the mark "AUD."

*Change from Audit to Credit.* A student may change his registration from audit to credit, or vice versa, within 30 days after the beginning of the semester in the fall and spring, and within two weeks after the beginning of the summer session. The request for change must be made in writing to the Graduate School. Special forms are available at the Business Office.

*Grades.* At the close of the semester, the student receives written notice by mail of the grades he has received. The following letter grades are used:

A	Excellent	F	Failure
B	Good	Aud	Auditor
C	Fair	Inc	Incomplete
D	Passable	W	Withdrawn

## TRANSCRIPT OF RECORD

Inclusion in Personnel Record for Department of Agriculture Employees. To aid in effecting its promotion-from-within policy, the Department has provided (USDA Administrative Regulations, Title 8, Chapter 42, paragraphs 1548-1551, dated 10-13-48) that a record of Graduate School credits earned by its employees is to be placed in official personnel files of the agency. Unless specifically requested by the employee that such action not be taken, the Graduate School forwards, upon completion of the courses or at the end of the year, a copy of the student's record, without cost to the employee, to the personnel officer of the unit of the Department of Agriculture in which the student is employed.

*Transcripts for Employees of Other Agencies.* The student who is not an employee of the Department of Agriculture can obtain an information record or transcript for his personnel file or for other purposes by requesting such a record in writing from the Graduate School. There is a charge of \$1.00 for each information record or transcript.

## WITHDRAWAL AND REFUNDS

Application for withdrawal from Graduate School classes must be made in writing to the Registrar. A form for this purpose is available in the Business Office. *To report the dropping of a course to an instructor does not constitute official withdrawal.* Permission to withdraw is not given to a student who does not have a clear financial record.

Refund of tuition fees *only* can be granted in cases of official withdrawal according to the following schedule:

<i>Fall and Spring Semesters</i>	<i>Refund</i>
During the first and second weeks of the semester	Tuition less \$5.00 registration fee for each course. (A minimum of \$5.00 for each course will not be refunded.)
During the third and fourth weeks of the semester	60 per cent of the total tuition.
During the fifth and sixth weeks of the semester	50 per cent of the total tuition.
<i>Summer Session</i>	
During the first week of the session	Tuition less \$5.00 registration fee for each course.
During the second week of the session	60 per cent of the total tuition (A minimum of \$5.00 for each course will not be refunded.)
During the third week of the session	50 per cent of the total tuition.

*Refunds are computed as of the date that the application for withdrawal is received in the Business Office.* In no case can tuition be reduced or refunded because of non-attendance at classes. No refund is made of laboratory or other incidental fees.

Because commitments for instruction and other arrangements are necessarily made at the beginning of the semester, no refunds for any reason can be made except in accordance with the schedule.

The Graduate School reserves the right to cancel any course if registration does not warrant continuance; to limit, to discontinue, to postpone, or to combine classes; to change instructors; to change classroom assignments; to make any changes deemed advisable in registration and in fees; and to require the withdrawal of any student at any time for such reasons as the Graduate School deems sufficient.

# Programs

## SPECIAL PROGRAM

The special program of the Graduate School is designed to develop special educational offerings in cooperation with one or more Federal departments and agencies. Such offerings include conferences, specially developed courses, institutes, pilot programs, seminars, short courses, and workshops. All these are intended to assist Federal departments and agencies in meeting new, difficult, and changing educational and training needs.

Among the special activities regularly operative in the Graduate School are management development programs for Federal executives and field managers, statistical methods for Federal executives, automatic data processing seminars, and others. Other special courses include technical writing, supervision and management, power systems engineering, servomechanisms, and Federal personnel management.

For more information about the special program, contact the Assistant Director, Graduate School, U. S. Department of Agriculture, Washington, D. C. 20250.

## CORRESPONDENCE PROGRAM

The correspondence program of the Graduate School is designed primarily for field employees of the Federal departments and agencies. However, the courses are open to others as facilities permit. In addition, there are many correspondence courses offered by colleges and universities that are useful for Federal employees. The Graduate School is happy to assist a student in locating such courses. For additional information, write to the Manager, Correspondence Program, Graduate School, U. S. Department of Agriculture, Washington, D. C. 20250.

## INTERNATIONAL PROGRAM

The international program of the Graduate School is designed for officials from other countries who come to the United States for study. The courses are tailored to the needs of the individuals in the group in so far as possible. These courses are offered in cooperation with, and at the request of, the Agency for International Development. Courses concerned with public administration, personnel management, office management, administrative management, and other needs of the developing countries have been given.

For additional information, contact the Manager, International Program, 1028 Connecticut Avenue, N.W., Suite 1100, La Salle Building, Washington, D. C. 20006.

## PUBLIC LECTURES

The Graduate School presents public lecture series on current problems in agriculture and science, as well as in national and international affairs for employees of the Federal departments and agencies and others. Lectures that relate directly to the needs and interest of Federal employees are given during official working hours.

## PUBLICATIONS AND PRESS

The publications of the Graduate School include:

A general annual *Catalog*.

An annual *Special Program Bulletin*.

A schedule of resident evening courses, issued each semester—fall, spring, and summer.

An annual *Correspondence Bulletin*, listing courses given by correspondence.

Books and pamphlets, published at irregular intervals. These are original contributions by members of the faculty, special lectures devoted to the advancement of the arts and sciences, and significant studies by employees of the Department of Agriculture, which the Department has been unable to publish. A partial list of these publications is in the back of this volume.

#### RESIDENT EVENING PROGRAM

Courses offered in the resident evening program during the academic year 1964-65 are listed on the following pages by department of instruction. The departments are listed alphabetically.

The word Fall, Spring, or Summer shows the semester in which the course is offered. The number of credits shows the value of the course in semester hours. Bracketed numbers show courses that will not be offered in 1963-64.

Courses numbered 1-100 are non-credit; 100-399, undergraduate; 400-699, advanced undergraduate (senior) and graduate; above 699, graduate only.



# Biological Sciences

## DEPARTMENTAL COMMITTEE

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Federal Government workers in the biological sciences are increasingly faced with the difficulty of keeping abreast of rapid advances in the application of principles and new gains in basic knowledge. In addition, many other Government workers in fields indirectly related to biology need understanding of basic principles in the biological sciences to work competently in their own fields.

The Department of Biological Sciences offers courses to meet the needs of each of these groups. Unless specifically stated, there is no laboratory work. The instructors are all outstanding specialists from the Federal Government and other research institutions.

## 1-115. Introduction to Modern Biology

Year, 2 credits each semester

JOHN M. BARNES

Elementary course, at college level, designed for those desiring general knowledge of structure, activities, interrelationships, and origin of plants and animals. Lectures supplemented with demonstrations. Two Saturday field trips or demonstration laboratories each semester. *Prerequisites:* High school biology and chemistry helpful, but not required.

## 1-126. Medical Terms Simplified

Fall, 2 credits

LOUISE E. BOLLO

Designed for medical coders, librarians, secretaries, and other workers in health field who deal with technical medical terms. Names, causes, and classification of diseases. Study of anatomical location of disease processes. Previous experience in health work helpful, but not required.

## 1-90. Basic Principles of Laboratory Animal Care

Year, non-credit

GARLAND T. JOHNSON

Background of basic biological concepts for animal colony supervisors and caretakers and medical laboratory technicians, especially in relation to common laboratory animals. First semester: Life and living organisms, skeletal, muscular, circulatory, respiratory, digestive, excretory, nervous and endocrine systems, reproduction, genetics and breeding, nutrition, and metabolism. Second semester: Infectious disease, disease control and therapy, sanitation and sanitary procedures, animal handling, practical diagnostic methods, and animal dissection. Students may register for the second semester without having completed the first if they have training in high school biology.

## 1-95. How Plants Grow

Spring, non-credit

THOMAS R. SODERSTROM

To assist the backyard gardener to understand the plants he grows. Nutrition and reproduction of plants, structure and function of plant parts, characteristics of major plant groups, and plant geography. Presented in nontechnical terms in so far as possible. Some laboratory observation. No prerequisites other than interest and curiosity in biology of Plant World.

## 1-96. Systematic Botany of Wild Flowers

Summer, non-credit

THOMAS R. SODERSTROM

Elementary nontechnical course, designed to enable the student to determine names and relationships of wild and cultivated plants in vicinity of Washington, D. C. Principally directed laboratory following introductory background lectures. Weekend field trips to nearby areas to learn proper methods of collecting and preserving plant materials and to observe plants in natural surroundings. Laboratory devoted largely to the identification of these collections.

## 1-325. Forest Entomology

Fall, 2 credits

INSTRUCTOR TO BE ANNOUNCED

Survey course in forest entomology. Brief history. Major groups of forest insects. Detection, diagnosis, and appraisal of damage. Silvicultural, biological, and chemical control, including biological and ecological considerations. Current practices and research.

## 1-560. Fundamentals of Medical Microbiology

Fall, 3 credits. Repeated in Spring

MATTHEW H. FUSILLO

Basic aspects of bacteriology, mycology, virology, and parasitology. Lectures on handling of clinical specimens and cultural isolation and identification techniques of specific infectious agents in each group. *Prerequisites*: Some instruction or training in clinical laboratory techniques, and/or special permission.

## 1-565. Fundamentals of Immunology

Spring, 3 credits

BERNARD W. JANICKI

Basic characterization of antigens, antibodies, and mechanisms of their reactions as applied to problems in biology and medicine, with emphasis on infectious diseases. *Prerequisites*: Advanced course in microbiology and/or special permission.

## 1-570. Design of Experiments in Biological Sciences

Year, 2 credits each semester

E. JAMES KOCH

Principles of planning and analyzing animal and plant experiments. Basic design principles of completely randomized, randomized block, Latin Square, factorials, confounding, split plot, lattices, incomplete blocks, and other designs. Principles and application of correlation, regression, covariance, multiple regression, experimental and sampling errors, components of variance, missing data, mean separation, individual degrees of freedom, size, or plot, and size of experiment to experimental design. *Prerequisite*: Course in experimental statistics, several years of experience in applying principles of statistics to experimental data, or special permission.

## 1-603. Advances in Plant Breeding and Genetics

Fall, 3 credits

MARTIN G. WEISS and SPECIALISTS

Methods of breeding naturally self- and cross-pollinated plants. Theories of early generation testing. Nature and use of heterosis in plant breeding. Techniques of self-pollination and hybridization. Plant improvement through interspecific hybridization and polyploidy. *Prerequisites*: Courses in principles of genetics and elementary plant breeding, or equivalent.

## 1-712. Advances in Nutrition

Schedule to be arranged, 2 credits

RUTH M. LEVERTON and ASSOCIATES

Designed primarily for dieticians, nutritionists, and others interested in human nutrition. Review of present status of field with special emphasis on evaluation of recent findings for applications to nutrition programs. Nutrition problems of individuals, families, and communities. *Prerequisites*: Current knowledge of organic chemistry, basic biochemistry, and food composition.

SPECIAL PROGRAM IN NATURAL HISTORY FIELD STUDIES

The following courses form a special program in natural history field studies given in cooperation with the Audubon Naturalist Society of the Central Atlantic States, Inc. These courses are intended to increase knowledge and enjoyment of the natural world around us. They are also designed to help teachers, youth leaders, and parents in presenting subject matter in natural history and conservation. They provide experience in using the outdoors as a classroom and in using natural materials in the school.

The courses are presented at a level to appeal to adults with a high school or college education, but without advanced training in natural sciences. Field trips offer opportunity to observe in nature the subjects studied. The trips are planned to visit all the major ecological communities in the Central Atlantic region in the two-year series.

The student who satisfactorily completes the prescribed program for credit will receive a Certified Statement of Accomplishment in Natural History Field Studies. Any of the courses may be taken separately, but the entire series is planned as an integrated unit to provide an understanding of the ecology of the Central Atlantic region. Although there are no formal prerequisites for any of the courses, the student can expect maximum benefit from taking them in the order listed.

## 1-132. Introduction to Outdoors

Fall, 1 credit

LEWIS A. BUCK, A. B. FOSTER, BEN O. OSBORN, and MARVIN A. PISTRANG

Outdoors as environment for man. Ecological point of view applied to study of nature and use and conservation of natural resources. Recreational and scientific uses of wilderness and inhabited areas. Methods and practices of nature study and other forms of outdoor recreation. Field trips designed for those with little outdoor experience as well as more advanced hikers. Three Saturday field trips and optional overnight camp. Not required for Certified Statement of Accomplishment.

### FIRST YEAR

## 1-130. Physical Environment I: Geology

Fall, 1 credit

MARVIN A. PISTRANG

Principal geological features and geologic history of Central Atlantic Region. Properties of common minerals and rocks. Influence of geology on local physical environment of organisms. Two Saturday field trips.

## 1-125. Physical Environment II: Climate and Soils

Fall, 1 credit

PAUL E. LEHR and EARLE D. MATTHEWS

Physical factors that influence plant and animal life. General climate and climatic types. Microclimates in relation to local physiographic and topographic features. Nature of soils and how they influence environment. Major climatic, physiographic, and soil areas of Central Atlantic Region. Saturday field trip.

## 1-131. Basic Biology

Fall, 1 credit

INSTRUCTOR TO BE ANNOUNCED

Basic life processes. Classification of living things. Structures and functions of plants. Evolving patterns of animal forms, stressing adaptation of structure and function to environment. Representatives of plant and animal kingdoms. New concepts and trends in biology.

## 1-133. Introduction to Ecology

Spring, 1 credit

BEN O. OSBORN and ROBERT E. WILLIAMS

Survey of fundamental principles of ecology. Factors and dynamics of relations of organisms to their environment. Classification of ecological communities and methods of studying them in



the field. Lectures and discussion designed to prepare the student for field study of biotic communities. No prerequisites, but courses in basic biology (Introduction to Modern Biology, Basic Biology, or Physical Environment I: Geology) good preparation.

## 1-134. Animal Behavior

Spring, 1 credit

ALLEN L. STEINHAUER

Introduction to behavior of principal classes of animals found in Central Atlantic region. Instinctive and learned responses of animals. Territory, courtship, migration, and family, social, and predatory relations in birds and animals.

## 1-135. Biotic Communities: Aquatic and Marsh

Spring, 1 credit

LEWIS A. BUCK and SPECIALISTS

Field study of fresh water streams, ponds, and marshes. Brackish estuaries and bays. Brackish and salt marshes. Ocean beaches and dunes. Introduction to Ecology needed as preparation. Four Saturday field trips, including overnight trip to Eastern Shore.

### SECOND YEAR

## 1-136. Nature Teaching and Leadership Techniques

Fall, 1 credit

JOHN L. TROTT, JR.

Techniques of presenting natural history and conservation subjects in the classroom and making the outdoors a laboratory for the class. Essentials of leading adult and youth groups on natural history field trips. Short Saturday field trips.

## 1-138. Biotic Communities: Deciduous Forests

Fall, 1 credit

BEN O. OSBORN and ROBERT E. WILLIAMS

Field studies of climax, second-growth, and early successional stages of oak, hickory, oak, chestnut, mixed mesophytic, and bottomland forests. Relation of forest types to local environment. Introduction to Ecology needed as preparation. Three Saturday field trips.

## 1-137. Conservation Philosophy in United States—Seminar

Fall, 1 credit

SHIRLEY A. BRIGGS

Critical reading and discussion of conservation classics. Evolution of conservation principles in United States traced through works of Powell, Marsh, Leopold, and others. Basic concepts in ecology, philosophy, and sociology considered in relation to development of conservation ethic for individual and for society. Each student is expected to read several books and to report on at least one.

## 1-139. Wildlife Populations and Their Distribution

Spring, 1 credit

WINSTON E. BANKO

Geographic origin and classification of modern birds and mammals. Population dynamics. Bird migration. Influence of man on distribution and abundance of some species. Principles of wildlife management. Introduction to Ecology and Animal Behavior good preparation.

## 1-140. Principles and Practices of Land Use

Spring, 1 credit

EARLE D. MATTHEWS and BEN O. OSBORN

Economic, social, political, ecological, and physical principles that govern how land is used. Practices through which principles are applied to land in different uses. Application of conservation principles to land resource use. Introduction to Ecology, Conservation Philosophy in United States, and Wildlife Populations and Their Distribution good preparation. Two Saturday field trips.



## 1-141. Biotic Communities: Coniferous Forests

Spring, 1 credit

BEN O. OSBORN and ROBERT E. WILLIAMS

Field study of climax, second-growth, and early successional stages of oak-pine forests of Coastal Plain, Piedmont, and Blue Ridge, including sites in agricultural use. Northern coniferous and deciduous forest mixtures of Allegheny Mountains. Introduction to Ecology and Biotic Communities: Deciduous Forests needed as preparation. Three Saturday field trips, including overnight trip to Allegheny Mountains.

### OPTIONAL COURSES

The following courses supplement the prescribed program for the Certified Statement of Accomplishment in Natural History Field Studies, but are not required for the certified statement.

## 1-129. Weather

Fall, 1 credit

PAUL E. LEHR

Nature of atmosphere and elements of weather. Mechanics and processes that produce weather. Air masses, fronts, and storms. Weather maps and forecasting. Recent developments in meteorology.

## 1-142. Plant Identification I

Spring, 1 credit

STANWYN G. SHETLER

Introduction to principles of plant taxonomy and techniques of plant collection and identification. Study of herbarium specimens of principal vascular plant families of Central Atlantic Region. Laboratory practice in identifying specimens.

## 1-145. Plant Identification II

Spring, 1 credit

STANWYN G. SHETLER

Field practice in identification of plants by use of taxonomic keys and descriptions. Study of distinguishing characteristic of higher taxonomic groups. Four Saturday field trips. *Prerequisites:* Plant Identification I, or equivalent.

## 1-143. Insect Life

Spring, 1 credit

FLOYD P. HARRISON

Introduction to principal insect families of Central Atlantic Region. Identification, life histories, and ecology of important insect forms. Importance of insects in biotic communities.

### SPECIAL PROGRAM IN PLANT QUARANTINE STUDIES

The following courses form a special in-service training program in plant quarantine studies. They are given at the New York City facilities of the Division Training Center, Plant Quarantine Division, Agricultural Research Service. The program is under the supervision of Ira A. Lane, Employee Development Officer, Plant Quarantine Division, Agricultural Research Service.

## 1-515. Plant Quarantine Entomology

Schedule to be arranged, 6 credits

MAYNARD J. RAMSAY and ASSOCIATES

Concentrated and technical course in entomology, especially designed to enable qualified and experienced selectees to fully identify foreign insect pests regularly encountered in plant quarantine work, both in adult and immature stages. To familiarize participant with dissection and mounting techniques for larval skins, genitalia, epipharynxes, and similar precise operations. To acquaint enrollee with current classification and nomenclatural concepts in insect orders under consideration. *Prerequisite:* Basic Training for Plant Quarantine Inspectors, or equivalent.

## 1-535. Basic Training for Plant Quarantine Inspectors

Schedule to be arranged, 10 credits

WILLIAM FRIEDMAN  
IRA A. LANE  
JACK E. LIPES  
MAYNARD J. RAMSAY  
ERNEST RICHMAN  
HAROLD S. SHIRAKAWA

Consecutive 26-week program for new Federal plant quarantine inspectors. Designed to orient the new employee in the Department of Agriculture. Its organization, function, and personnel policies. Basic legislation and other legal authorities affecting plant quarantine operations. Principles of plant quarantine enforcement. Federal-State relationships. Inspection and treatment techniques and procedures. Technical aspects of foreign pest evaluation. Identification and distribution in the fields of entomology, plant pathology, and nematology as applicable to foreign plant quarantine enforcement. Commodity recognition as applicable to plant materials moving in international commerce.

## 1-615. Plant Quarantine Pathology

Schedule to be arranged, 4 credits

HAROLD S. SHIRAKAWA

Designed for regulatory officials interested in quarantine phytopathology. Emphasis on detection, recognition, and nomenclature of disease-causing organisms frequently encountered in plant quarantine operations, particularly those not known to occur or to be widely distributed in the United States.

## 1-708. Plant Quarantine and Plant Protection

Schedule to be arranged, 10 credits

ERNEST RICHMAN

For foreign trainees studying plant quarantine methods in United States. Organization of Department of Agriculture and interrelationships of agencies. Regulatory and control organization and policy, basic quarantine legislation, fundamental principles affecting promulgation of quarantines, and restrictive orders. Field observations and participation in operational activities of Plant Quarantine Division at ports of entry. Identification and distribution in the fields of entomology, plant pathology, and nematology as applicable to foreign plant quarantine enforcement. Review and observation of field control projects and plant operations in Northeast, Southeast, and Southwest Regions.

## 1-709. Plant Quarantine Nematology

Schedule to be arranged, 6 credits

WILLIAM FRIEDMAN

Graduate level study and practice in detection, isolation, preparation, and identification of nematodes of plant quarantine significance. Special emphasis on host relationships, world distribution, and applicable treatments. Guest lecturers.

### SPECIAL PROGRAM IN SOIL SALINITY

## 1-540. Soil Salinity and Reclamation

Schedule to be arranged, 4 to 6 credits

LOWELL E. ALLISON

Graduate course for qualified foreign trainees, emphasizing principles and practices for diagnosis of saline and sodic soil problems. Daily lectures and discussions with emphasis on soil-water-plant relationships and chemical analysis of salt-affected soils and irrigation waters. Trips into irrigated valleys to observe occurrence of saline and sodic conditions, reclamation procedures, land levelling, deep plowing, drainage systems, and crop management under intensive irrigation with saline waters. A 12-week, in-service training source offered quarterly at U. S. Salinity Laboratory, Agricultural Research Service, Riverside, California.

# Languages and Literature

## DEPARTMENTAL COMMITTEE

J. Kendall McClarren, *Chairman*

Erwin Jaffe, John S. Lawrence, Foster E. Mohrhardt, Rupert F. Mouré, Lionel W. Nelson, Kenneth W. Olson, Franklin Thackery (*Vice-chairman*)

It is of primary importance for the Federal servant to write and speak effectively. Scientists, technicians, and professional personnel especially need to know how to communicate their knowledge both to the layman and to their associates. In fact, at all levels of the Federal Government, the employee should be competent in writing and speaking. The Department of Languages and Literature offers courses at varying levels to meet these needs.

There are also available programs in editorial practices and library techniques that lead to certified statements of accomplishment.

## CERTIFIED STATEMENT OF ACCOMPLISHMENT IN EDITORIAL PRACTICES

A Certified Statement of Accomplishment in Editorial Practices is granted to a student who has completed an organized program intended to provide basic training for responsible editorial and publications work. This program should be of special interest to those who want to enter editorial work and to those in editorial or publications work who want to prepare for advancement. A good educational background is essential for success in this profession. It is recommended that a student working toward the certified statement should preferably have an undergraduate degree, or at last two years of college work, or at minimum creditable work experience in a subject-matter field. An applicant for the certified statement must file a transcript of his high school or college record before completion of his program.

## Requirements

1. Demonstrated facility in English grammar and composition. This requirement can be met by successful completion of an examination to be given as a part of the course, Principles of Editing and Their Application.
2. 24 semester hours of credit with an average grade of B or better in the following courses:
  - a. Required courses: (15 credits)
    - Principles of Editing (3)
    - Intermediate Editing (3)
    - Printing, Layout, and Design (2)
    - Editing Technical Manuscripts (2)
    - Producing the Popular Publication (2)
    - Advanced Practice in Editing (3)
  - b. Editing Electives: (6 credits)
    - Basic Reference Service and Reference Tools (2)
    - Feature Writing (2)
    - Graphic Arts in the Federal Government (4)
    - Graphic Methods of Presenting Statistics (2)
    - Indexing (2)

Introduction to Bibliographic Science (2)  
 Maps and Charts (2)  
 Official Writing (2)  
 Technical Writing (2)  
 Written Word in Official Communication (2)

*Other courses may be approved depending upon the needs of the student.*

- c. Subject-Matter Electives: Remaining hours of credit in subject-matter courses as recommended by the student's employer or as chosen by the student. May be selected from the Editing Electives listed above if appropriate to the position for which the student is preparing. This requirement can be waived for students who have college work or acceptable experience in a subject-matter field.

*A student seeking this certified statement should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. Equivalent courses will be accepted by transfer from other institutions.*

#### CERTIFIED STATEMENT OF ACCOMPLISHMENT IN LIBRARY TECHNIQUES

A Certified Statement of Accomplishment in Library Techniques is granted to a student who has completed an organized course of study intended to provide basic training in this field. Graduation from high school, or the equivalent, is the minimal educational background required. An applicant for the certificate must file a transcript of his high school or college record before completion of his certificate program.

#### Requirements

1. Demonstrated facility in English grammar and composition. This requirement can be met by the successful completion of an examination given as part of the course, Introduction to Library Service.

2. 20 semester hours of credit with an average grade of B or better in the following courses:

- a. Required courses: (15 credits)
  - Introduction to Library Service (2)
  - Introduction to Cataloging and Classification (2)
  - Cataloging and Classification II (2)
  - Principles of Library Organization (2)
  - Basic Reference Service and Reference Tools (2)
  - Introduction to Bibliographic Science (2)
  - Library Techniques—Seminar (3)
- b. Electives: (5 credits)
  - A Foreign Language
  - Administrative Procedure (2)
  - Documentation (2)
  - Documentation in Science and Technology (2)
  - Indexing (2)
  - Law Librarianship (2)
  - Maps and Charts (2)
  - Medical Terms Simplified (2)
  - Official Writing (2)
  - Principles of Editing and Their Application (3)



*Other courses may be approved depending upon the needs of the student.*

*A student seeking this certificate should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. Equivalent courses will be accepted by transfer from other institutions.*

## English—Grammar and Writing

### 2-95. Improving Reading Ability

Fall, non-credit. Repeated in Spring and Summer

EVELYN-HILARY FERGUSON  
JEROLD N. WILLMORE

Developmental reading for average and superior reader. Designed to increase selectivity, flexibility, purpose, and speed. Individualized training. Analysis of reading, vocabulary, and visual abilities to help determine areas needing development. Workbook exercises, periodic evaluation of progress, short talks on principles of efficient reading, and practice for individual needs. Final test to determine progress and areas needing further development.

### 2-35. English for Secretaries—Rapid Review

Fall, non-credit. Repeated in Spring and Summer

ROBERT B. ANDERSON  
ALLEN H. JONES

Sentence structure, capitalization, punctuation, vocabulary, and spelling.

### 2-38. English for Foreigners

Fall, non-credit. Repeated in Spring

WILLA B. WEEKS

Reading and understanding English. Pronunciation exercises, grammar, vocabulary building and conversation, and idiomatic usage. Early intermediate level. Some knowledge of English essential.

### 2-42. Conversational English for Foreigners

Summer, non-credit

WILLA B. WEEKS

Intermediate to advanced, including grammar, idiomatic structure, and phonetics. Everyday speech vocabulary, with dialogues covering many situations.

### 2-112. Practical English Usage

Fall, 2 credits. Repeated in Spring and Summer

ROBERT B. ANDERSON  
ALLEN H. JONES  
KATHRYNE B. KOZAK  
DOROTHY P. PRITZKER  
ROBERT C. REED

Refresher course in English grammar and usage. Exercises in analyzing sentences to give the student basic knowledge of sentence structure and grammar required for more advanced courses in grammar and writing. Exercises in correct usage and punctuation.

### 2-119. Vocabulary Building

Fall, 3 credits. Repeated in Spring and Summer

ALLEN H. JONES

Study of sources and origins of words to gain insight into present meanings. Principles of word formation, dictionary study, and exercises in word selection. Emphasis on common Latin and Greek roots used in forming English words.

## 2-222. English Composition

Year, 3 credits each semester

ROBERT B. ANDERSON  
ALLEN H. JONES  
ROBERT C. REED

Equivalent of college Freshman English. Introductory course in writing and English usage, designed especially for those who need a course preparatory to more advanced English studies, and for those who want to learn techniques of expository writing. Fundamentals of good writing. Exercises in writing short and long themes and in studying, analyzing, and evaluating selected English prose texts. *Prerequisite*: High school English.

## 2-223. College Grammar

Fall, 3 credits

SUSAN E. HARMAN

Grammatical principles, stressing sentence structure and correct English form. Study of sentence structure through diagramming and of correct English form through detailed discussion and examination of parts of speech. Lectures on history and development of inflectional and derivational forms. Analysis of examples of good and bad English. *Prerequisite*: English Composition, or equivalent.

## 2-230. Sentence Revision

Spring, 2 credits

DOROTHY P. PRITZKER

Designed for the student who wishes to improve his writing. Review of grammatical elements of sentence, study of established patterns of sentence construction, and constant practice in rewriting sentences. *Prerequisite*: College Grammar, or equivalent.

## 2-250. College Rhetoric

Spring, 3 credits

ROBERT B. ANDERSON

Advanced English composition. Designed to enable the student to develop clear, concise, and effective writing style. Study and application of art and principles of composition. Stress on effective use of language and vocabulary. Examination of four basic types of discourse: Exposition, argument, description, and narration. Emphasis dependent upon needs and interests of students. Course in writing. Assignment of composition almost every week. *Prerequisite*: English Composition, or equivalent.

## 2-226. Official Writing

Fall, 2 credits. Repeated in Spring

JON F. GREENEISEN  
JAMES H. McCORMICK  
LAWRENCE E. SARBAUGH

Designed for those who have to write as part of their jobs, but who are not necessarily professional writers. Stresses that official Government writing, as all writing, should be clear, simple, concise, and easy to understand. Emphasis on eliminating unnecessary words and phrases in official writing. Covers many forms of Government writing including articles, reports, letters, and memoranda. Several short writing assignments. *Prerequisite*: English Composition, or equivalent in writing experience.

## 2-227. Written Word in Official Communication

Spring, 2 credits

JON F. GREENEISEN  
JAMES H. McCORMICK

Continuation of Official Writing. Stress on writing as effective tool in official communication. Designed to meet needs of nonprofessional writers who prepare reports, scripts, and releases requiring working knowledge and application of writing techniques. Pre-writing including gathering, organizing, and outlining basic subject matter. Drafting including logical development into informative prose of the materials outlined. Reviews of order of arrangement and content, style, structure, and readability. Emphasis on practice in writing. *Prerequisite*: Official Writing, or equivalent.

## 2-235. Fiction Writing

Fall, 2 credits. Repeated in Spring

OLGA MOORE ARNOLD

Stress on such fiction fundamentals as plotting, characterization, dialogue, story organization, testing readability and interest, and increasing dramatic quality of writing. Emphasis on writing techniques that increase salability of student manuscripts by discussing editorial taboos, ways to obtain salable story ideas, and to market manuscripts.

## 2-242. Advanced Fiction Writing

Spring, 2 credits

OLGA MOORE ARNOLD

Discussion, criticism, and suggestions for revising the student manuscript. Emphasis on methods of slanting for particular markets, discussion on what editors buy and why, and ways to polish manuscripts to increase sales possibilities. *Prerequisite*: Fiction Writing, or equivalent.

## 2-280. Feature Writing

Fall, 2 credits

MARIE A. DOLAN

Fundamentals of writing feature articles for magazines and newspapers. Lecture, discussion, and practical experience in finding salable ideas. Research. Interviewing. Market analysis and feature writing techniques basic to preparing articles for publication.

## 2-281. Advanced Feature Writing

Spring, 2 credits

MARIE A. DOLAN

Writing more complex feature articles. Emphasis on narrative techniques. Slanting for special markets. Illustrating, revising, and polishing manuscripts. Class discussion and criticism of student articles.

## 2-450. Technical Writing

Fall, 2 credits. Repeated in Spring

CARLETON E. BRETT

ROY A. CARTER

RUTH NORDIN

WILBERT SCHAAL

Designed to help the scientist and economist improve their research reports and articles for professional publications. Survey of fundamentals of writing the technical report: its characteristics, parts, functions, steps in preparation, and process of criticism. Preparation, criticism, and revision of reports and articles—written for official use when possible. *Prerequisite*: Undergraduate degree in one of the sciences, engineering, economics, or other technical field, or equivalent.

## 2-285. Writing for Data Processing Installations

Fall, 2 credits. Repeated in Spring and Summer

ROBERT E. NICHOLSON

Designed for those responsible for preparing written material in data processing field. Emphasis on composition concerned with electronic data processing terminology and concepts. Class exercises in preparation of written documents. *Prerequisites*: Official Writing and Basic Concepts of Data Processing, or equivalent. Some knowledge of electronic data processing concepts and composition essential.

## 4-330. Government Letter Writing

(See P. 49)

## 4-421. Writing Procedures and Instructions

(See P. 49)

## Literature

## 2-330. Great Books

Year, 2 credits each semester

M. CLARE RUPPERT

Group discussion of important works in poetry, history, philosophy, and criticism. A leader helps with the reading and understanding, but the books themselves are the teacher. Designed to give insight into perennial, and therefore contemporary, problems. Interest in ideas and belief in free discussion required. Most books read in entirety. Discussion centers around the following authors:

Reading List A (1964-65 and alternate years)

Fall Semester: Bible, *Ecclesiastes*; Homer, *Iliad*; Aeschylus, *Oresteia*; Sophocles, *Oedipus at Colonus*; Plato, *Symposium and Republic*, Bk. VI-VII; Aristotle, *Ethics*; Thucydides, *History of the Peloponnesian War*; Epictetus, *Discourses* (Selections); Lucretius, *On the Nature of Things*.

Spring Semester: Bible, *Gospel According to St. Matthew*; Shakespeare, *Macbeth*; Milton, *Areopagitica*; Adam Smith, *Wealth of Nations*; Descartes, *Discourse on Method*; Swift, *Gulliver's Travels*; de Tocqueville, *Democracy in America*; Thoreau, *Civil Disobedience*; Kant, *Perpetual Peace*; Mill, *On Liberty*; Twain, *Huckleberry Finn*.

Reading List B (1965-66 and alternate years)

Fall Semester: *Declaration of Independence*; Bible, *Book of Job*; Homer, *Odyssey*; Sophocles, *Antigone and Oedipus Rex*; Plutarch, *Lives: Alexander and Caesar*; Plato, *Apology and Crito*; Aristotle, *Politics*, Bk. I; Marcus Aurelius, *Meditations*; St. Augustine, *Confessions*; St. Thomas Aquinas, *On the Law*.

Spring Semester: Dante, *Divine Comedy*; Machiavelli, *The Prince*; Shakespeare, *Hamlet and King Lear*; Hobbes, *Leviathan*; Rousseau, *Social Contract*; Locke, *Civil Government*; *Federalist Papers*; Marx, *Communist Manifesto*.

## 2-331. Significant Books of the Twentieth Century

Summer, 2 credits

M. CLARE RUPPERT

Books discussed in light of their influence upon twentieth century man, his thought and behavior in our contemporary society.

## Reading List

James, *Pragmatism*; Frazer, *Golden Bough*; Dewey, *Democracy and Education*; Keynes, *Economic Consequences of the Peace*; Proust, *Remembrance of Things Past* (vol. I); Joyce, *Ulysses*; Mann, *Magic Mountain*; Spengler, *The Decline of the West*; Freud, *Basic Writings*; Toynbee, *Study of History* (1 v. abridged)

## 2-405. Literary Masterpieces of Orient

Year, 2 credits each semester

REZA ARASTEH

First semester: Classical literature of prophetic, philosophical, mystical, heroic, and romantic nature. Also literature written for enjoyment. *Epic of Gilgamesh*. Zoroastrian hymns, the *Koran*, and *Old Testament*. Ferdowsi's *Shahnameh*. Attar's *Conference of Birds*. Rumi, *Persian Mystic: Mathnawi and Diwan e Shama*. Khayyam's *Quatrains*. Al-Mu'arri's *Quatrains*. Sa'adi's *Gulistan*. Kai Ka'us' *Qabus Nameh*. Lady Murasaki's *Tale of Genji*. Tsao Hsueh Chin's *Dream of Red Chamber*. Kalidasa's *Shakuntala*. Panchatantra's *Thousand and One Nights*. Second semester: Works of great modern oriental writers, with emphasis on Gibran's *The Prophet*, Taha Hussein's *An Egyptian Childhood*, Hedayet's *The Blind Owl*, Jamalzadeh's *Short Stories*, Iqbal's *The Secret Self*, Tagore's *Toward the Universal Man*, Ryunosuke's *Rashoman*, and Liu teh Yun's *The Travels of Lao Ts'an*. Prerequisite: Bachelor's degree, or equivalent. Some acquaintance with Western literature, philosophy or history of orient, and/or travel there helpful.



## Information Methods

## 2-325. Basic Skills in International Communication

Fall, 2 credits

JOHN L. MADDUX

Persuasion and international public relations as applied by government agencies, commercial firms, and professionally trained individuals. Use of mass communication media, motivational research, and skilled interpersonal relations in formation of favorable foreign public opinion. Analysis of idea acceptance, rejection, and retention. Behavioral characteristics of targeted audiences. Personality factors in successful purveying of ideas. Specialized communication problems in dealing with newly emerging neo-literate societies. Introduction to international propaganda activities and strategic psychological operations in peace and war.

## 2-220. Indexing

Fall, 2 credits

KATHRYNE B. KOZAK

Indexing primarily for periodicals, bulletins, reports, and books. Emphasis on general procedures and matters of policy as well as on basic principles and techniques. Specific types of indexing adapted to various subjects and popular style, contrasted with technical and scientific styles. Examples of different kinds of indexes. Practical work in preparation of indexes, including making of cross references, alphabetizing, and editorial preparation of index cards and manuscripts for printer. Knowledge of library or editorial work desirable.

## 2-225. Principles of Editing and Their Application

Fall, 3 credits. Repeated in Spring

H. NELSON FITTON  
EDWARD H. KOENIG

Primarily survey course for those seeking information on editorial techniques involved in handling manuscripts after they leave the author and until issued in printed form. Discussion of fundamental principles of editing, including style (based on *Style Manual* of Government Printing Office), grammar, rhetoric, readability, organization, printing techniques, marking type, copyfitting, and proofreading; and considerations governing tables, charts, photographs, indexes, bibliographies, footnotes, and other parts of a publication. Opportunity to apply principles through practical work in editing. Good knowledge of grammar essential.

## 2-239. Intermediate Editing

Fall, 3 credits. Repeated in Spring

JEROME H. PERLMUTTER

Follows Principles of Editing and Their Application. Designed to give the student who is in or expecting to enter editorial work practical exercises and experiences in important editing situations. Emphasis on various types of manuscripts and reports that require the editor's attention. How-to-do-it aspect of editing, with step-by-step guidance in fundamentals. Basic editorial terminology and shortcuts to more effective editing. Case histories in publications problems. Slides, motion pictures, and other visuals used. Class workshops to assist the student in applying editorial techniques to manuscripts. *Prerequisite*: Principles of Editing and Their Application, or working editor.

## 2-237. Printing, Layout, and Design

Fall, 2 credits. Repeated in Spring

LESTER B. BOUNDS, DONALD C. MEEKER,  
BEN MUROW, and ELMO J. WHITE

Designed for those who plan, prepare, or procure printing, duplicating, distribution of books, pamphlets, folders, posters, charts, forms, and other printed or duplicated matter. Printing processes and printing media. Composition. Book binding. Typography and design. Printing types. Illustrations, including photo-engraving process and photographs. Printing design, rough layouts, finished layouts, and methods of copy fitting. Printing for the Government, including agency responsibility, Government Printing Office responsibility, and agency procedure for procuring printing. Other printing media, including silk screen, ozalid, varitype, cold-type processes, and others. Regulations and specifications of the Joint Committee on Printing, Government Printing Office paper catalog, *Style Manual*, printing, and binding regulations.

## 2-412. Editing Technical Manuscripts

Fall, 2 credits

JAMES E. REYNOLDS

Role of editor, including necessary qualifications, human relations aspect, relative responsibilities of editor and author, and ethical and practical basis for editing. Editorial evaluation of technical manuscripts, including organization of functional parts, sound procedural reasoning, correlation with technical work, style requirements, critical review, and preparation for reproduction. *Prerequisite*: Principles of Editing and Their Application, or equivalent.

## 2-415. Producing Popular Publication

Fall, 2 credits

DENNIS S. FELDMAN

Between the final editing and the time a pamphlet, brochure, or periodical comes off the press lies a multitude of details designed to enhance the appeal of the publication. The picture editor who lends his talents to make a publication come alive; the artist and layout man who create visual appeal; the caption writer—all these key personnel bring their specialized skills to bear. Examination of these fields by means of lecture and workshop. Techniques of preparing a manuscript for mass as well as for specialized audiences. Emphasis on the use of techniques that combine appeal with readability through extensive use of graphic materials. Review of production of low-budget publications. Students may bring to class problems or materials on which they are currently working. *Prerequisite*: Principles of Editing and Their Application, or equivalent.

## 2-360. Advanced Practice in Editing

Spring, 3 credits

GENIANA R. EDWARDS

Advanced instruction in literary and statistical editing and integration of graphics. Editing of practice manuscript, requiring reorganization, extensive editing, and uniform styling. Preparation of manuscript for printer and proofreading. Comparison of several Government agency styles for citations, tables, graphics, and other details. Adaptation of style to meet special requirements under rules of Government Printing Office. Administrative control of manuscript and proof in editorial offices. *Prerequisite*: Principles of Editing and Their Application, or equivalent.

## 2-152. Documentation

(See P. 28)

## 2-420. Documentation in Science and Technology

(See P. 28)

## 2-243. Using Visuals Effectively

Fall, 2 credits. Repeated in summer

DAVID M. GRANAHAH

Designed for those who teach, conduct meetings, or plan visual programs for groups or mass communication. Emphasis on planning and creating simple but effective visuals, using modern techniques and devices. Analysis of an audience. Development of visual ideas. Application of modern techniques. Demonstrations in use of motion pictures, closed circuit Television, three-dimensional visuals, visual cast, and other speaker-controlled devices. *Background in art not necessary.*

## Library Techniques

The following are nonprofessional library courses. They offer background information and training for the subprofessional library assistant and others whose work requires knowledge of library techniques.

## 2-125. Introduction to Library Service

Fall, 2 credits

LEILA P. MORAN, KIRBY P. PAYNE, and ASSOCIATES

Basic course for those expecting to pursue curriculum leading to nonprofessional certificate. Outlines purposes, procedures, techniques, development, and trends of librarianship. Individual as-

signments and conferences with students working toward the certificate. *Prerequisite*: Practical English Usage, or equivalent determined by basic English examination given prior to acceptance in course.

## 2-135. Introduction to Cataloging and Classification

Fall, 2 credits

SALME H. KURI  
ELIZABETH L. TATE

Organization of library material. Card catalog and auxiliary records. Cataloging rules and routines. Review of cataloging systems. Classification routines and review of classification systems.

## 2-139. Cataloging and Classification II

Spring, 2 credits

VIRGINIA CUNNINGHAM  
SALME H. KURI

Discussion of more difficult problems in descriptive cataloging, classification, and subject headings. Cataloging of practice collection. *Prerequisite*: Introduction to Cataloging and Classification, or one year's library experience.

## 2-137. Basic Reference Service and Reference Tools

Fall, 2 credits. Repeated in summer

ROBERT M. PIERSON

Designed to help the student learn how and when to use large number of important or typical reference books or sets of books, such as dictionaries, encyclopedias, indexes, atlases, and yearbooks.

## 2-138. Introduction to Bibliographic Science

Fall, 2 credits

JOSEPH T. POPECKI

Bibliographic science and bibliographic style for beginners. Variations and forms of bibliography. Study and comparison of general bibliographic tools and indexes of chief importance.

## 2-136. Principles of Library Organization

Spring, 2 credits

JOSEPH T. POPECKI

System and function of a library based on component parts and services that obtain regardless of size or purpose. Organization of function and service for utmost efficiency.

## [2-145.] Law Librarianship (1965-66 and alternate years)

Spring, 2 credits

JACK S. ELLENBERGER

Survey of law library administration with emphasis on research methods in primary and secondary authorities, international law, government publications, and work with Federal legislation. *Prerequisite*: Training in law or library work, or equivalent experience.

## 2-114. Maps and Charts (1964-65 and alternate years)

Fall, 2 credits

CATHERINE I. BAHN

Survey to give analyst, researcher, librarian or teacher working with maps understanding of both domestic and foreign maps and charts, the agencies that produce them, their catalogs and indexes, and their availability in map libraries. Study of United States, foreign, and international mapping activities on workshop basis to permit presentation and solution of individual problems. Pertinent information on map libraries, reference facilities, map acquisition, cataloguing and processing procedures and techniques. Presentation of maps, charts, reference materials, aids, and tools for laboratory use.



## 2-152. Documentation

Spring, 2 credits

JOHN SHERROD

Introductory survey designed to acquaint the student with many general topics involved in locating, organizing, and communicating specialized knowledge. Use of non-conventional systems in libraries and other information services.

## 2-420. Documentation in Science and Technology

Fall, 2 credits

JOHN SHERROD

Designed for engineers, research managers, scientists, and professional personnel engaged in technical information programs. Survey of availability and utilization of scientific and technical information from government, industrial, university, and other sources. Emphasis on non-conventional system design and implementation for optimizing communication of scientific and technical information.

## 2-160. Library Techniques—Seminar

Fall, 3 credits. Repeated in Spring

JOHN SHERROD

Overall summary and review of practical problems in library operations. Emphasis on work with the individual student. Special readings in literature of librarianship. Open only to the student who has completed all other requirements for a Certified Statement of Accomplishment in Library Techniques, including B average in all courses taken.

## Speech

## 2-228. Public Speaking for Beginners

Fall, 2 credits. Repeated in Spring

NORMA RENO MILLER

For those needing more self-confidence and ability in meeting business, club, church, and social speaking situations. Basic steps in speech preparation and delivery. Emphasis on extemporaneous speech of from one to 10 minutes in length. Twelve or more opportunities for each student to speak and receive written and oral constructive criticism.

## 2-229. Advanced Public Speaking

Fall, 2 credits. Repeated in Spring

LIONEL W. NELSON

Emphasis on gathering of materials, organization of speech, and repeated practice in delivery of various forms of public address. Wide application of audio-visual in various speech situations. Each student speaks at each meeting. Importance of personal recapitulation and student criticism. Instructor evaluation stressed. *Prerequisite*: Public Speaking for Beginners, or special permission.

## 2-232. Voice and Remedial Speech

Fall, 2 credits

BERNIECE C. WARREN

Drill course. Word analysis. Consonant clarity. Phrasing. Pausing. Pronunciation. Voice: power, pitch, inflection, quality, vitality, and stress. Reading from manuscript.

## 2-246. Voice and Diction

Spring, 2 credits

BERNIECE C. WARREN

Fundamentals as outlined in course description for Voice and Remedial Speech form basis of course. More advanced work presented. May be continuation of Voice and Remedial Speech for the student needing two courses in this area.

## 2-236. Remedial Speech

Summer, 2 credits

BERNIECE C. WARREN

Techniques to aid in the correction of specific speech problems. Practice course. Individual guidance.

## Foreign Languages

The Graduate School provides opportunities for instruction in a wide range of foreign languages. The courses presently available are listed on the following pages. Additional courses in these and other languages can be offered if there is sufficient demand. Students with special interests should consult the Registrar well in advance of the opening of a semester.

## 2-58. Latin for English

Year, non-credit

ALFRED D. STEFFERUD

Emphasis on learning Latin to improve the student's knowledge of English forms, grammar, vocabulary, and style. Practical, effective workshop in English usage and in skills useful in learning other languages. Attention to cultural values of Latin language and literature. Students encouraged to read novels in English about Rome and the Romans. Simple sentences and passages from the ageless Roman writers read. Recordings of Latin songs and stories played. Help given the student who wishes to develop his scientific vocabulary. No prior knowledge of formal grammar assumed.

## 2-63. Main Languages of the World

Summer, non-credit

JACOB ORNSTEIN

Intended to familiarize the student with features of the main languages of the world and their geographical distribution. Basic vocabularies presented in French, German, Italian, Japanese, Portuguese, and Russian languages. Discussion of their structures. Role of languages in world affairs. *Prerequisite*: Two years of high school, or one year of college work in a foreign language.

## Chinese

### 2-200. Elementary Mandarin Chinese (1964-65 and alternate Years)

Year, 4 credits each semester

LIONEL TSAO

Introductory course in written Mandarin Chinese.

### [2-201.] Intermediate Mandarin Chinese (1965-66 and every third year)

Year, 4 credits each semester

LIONEL TSAO

Intermediate course in written Mandarin Chinese.

### [2-202.] Advanced Mandarin Chinese (1966-67 and every third year)

Year, 3 credits each semester

LIONEL TSAO

Advanced course in written Mandarin Chinese.

## French

### 2-253. Elementary French

Year, 3 credits each semester

GERMAINE BARGIN  
MARIE-THÉRÈSE SOMMERVILLE

Basic grammar and vocabulary. Foundation work in speaking, understanding, reading, and writing French. For beginners.

### 2-254. Intermediate French

Year, 3 credits each semester

GERMAINE BARGIN

Sequel to Elementary French. Systematic review of French grammar. Continued training in speaking, understanding, reading, and writing French. *Prerequisite*: One year of French at college level, or equivalent.

### 2-68. Reading French

Fall, non-credit. Repeated in Spring and Summer

GEORGE VICAN

Basic French grammar, reading, and vocabulary building for students who have had some French and wish to review it.

### 2-87. Basic Conversational French

Fall, non-credit. Repeated in Spring and Summer

GERMAINE BARGIN

Designed to impart elementary facility in everyday spoken French. Through practice, the student learns to make himself understood and to follow conversations about family, meals, work, sports, travelling, and other common subjects. Useful for those planning to travel in a French-speaking country. No previous knowledge of French required.

### 2-255. Advanced French Conversation and Composition

Fall, 3 credits. Repeated in Spring

GEORGE VICAN

Designed to develop fluent style of idiomatic conversation on topics most likely to be met in travelling in French-speaking countries. Grammar review only if deemed necessary. Some composition and dictation exercises. Reading of current French newspapers and magazines. *Prerequisite*: Two years of college French, or equivalent. Good knowledge of grammar and considerable vocabulary.

### 2-59. Contemporary French Literature and Theater

Fall, non-credit. Repeated in Spring

GEORGE VICAN

Lectures and discussions on trends, thoughts, and problems of present-day French literature and theatre. Selection of one of following for detailed presentation: Camus, Malraux, Sartre, Mauriac, Anouilh, Bernanos, Aragon, Giraudoux, Péguy, Simon de Beauvoir, Maurois, Géraudy. Reading of at least one novel or play. Consideration of special interests and needs of the student. *Prerequisites*: Good background in French and interest in French literature.

## German

### 2-259. Elementary German

Year, 3 credits each semester

MARIANNE LEDERER

Basic grammar and vocabulary. Foundation work in speaking, understanding, reading, and writing German. For beginners.

## 2-260. Intermediate German

Year, 3 credits each semester

MARIANNE LEDERER

Sequel to Elementary German. Systematic review of German grammar. Continued training in speaking, understanding, reading, and writing German. *Prerequisite*: One year of German at college level, or equivalent.

## 2-88. Basic Conversational German I

Fall, non-credit. Repeated in Spring and Summer

CHARLES V. P. VON LUTTICHAU

Designed to impart elementary facility in everyday spoken German. Through practice, the student learns to make himself understood and to follow conversations about family, meals, work, sports, travelling, and other common subjects. Useful for those planning to travel in a German-speaking country. No previous knowledge of German required.

## 2-96. Basic Conversational German II

Spring, non-credit

CHARLES V. P. VON LUTTICHAU

Continuation of Basic Conversational German. Practice in conversation to improve vocabulary and fluency. *Prerequisite*: Basic Conversational German I, or equivalent.

## 2-66. Reading Scientific German

Fall, 3 credits. Repeated in Spring

MARIANNE LEDERER

MARIE L. FARR

CHARLES V. P. VON LUTTICHAU

Designed to offer the student preparing for advanced degree in biological and physical sciences background for language examination. No previous knowledge of German required.

## 2-97. Journey Through German Lands

Fall, non-credit

CHARLES V. P. VON LUTTICHAU

Introduction to scene and civilization of German-speaking countries of Europe through their geography, history, politics, economy, and culture. Insight into background of German-speaking countries the student may wish to visit. *Prerequisites*: Basic Conversational German I and Basic Conversational German II, or equivalent.

## Italian

### 2-270. Elementary Italian

Year, 3 credits each semester

MAGNA E. BAUER

Basic grammar and vocabulary. Foundation work in speaking, understanding, reading, and writing Italian. For beginners.

### 2-271. Intermediate Italian

Year, 3 credits each semester

VICTOR L. BONDI

Sequel to Elementary Italian. Systematic review of Italian grammar. Continued training in speaking, understanding, reading, and writing Italian. *Prerequisite*: One year of Italian at college level, or equivalent.

## Portuguese

### 2-290. Elementary Portuguese (1964-65 and alternate years)

Year, 3 credits each semester

JACOB ORNSTEIN

Basic grammar and vocabulary. Foundation work in speaking, understanding, reading, and writing Portuguese.



## [2-291.] Intermediate Portuguese (1965-66 and alternate years)

Year, 3 credits each semester

JACOB ORNSTEIN

Sequel to Elementary Portuguese. Systematic review of Portuguese grammar. Continued training in speaking, understanding, reading, and writing Portuguese. *Prerequisite*: One year of Portuguese at college level, or equivalent.

## Russian

### 2-45. Review of Elementary Russian

Summer, non-credit

THEODOSIE SCALA

Review of Russian grammar and its application, with stress upon its relationship to English grammar, wherever possible.

### 2-295. Elementary Russian

Year, 3 credits

TATIANA W. BOLDYREFF  
VICTOR A. FEDIAY  
JACOB ORNSTEIN  
THEODOSIE SCALA  
ANDRE A. ZINOVIEFF

Basic grammar and vocabulary. Foundation work in speaking, understanding, reading, and writing Russian. For beginners.

### 2-296. Intermediate Russian

Year, 3 credits each semester

VICTOR FEDIAY  
THEODOSIE SCALA  
ANDRE A. ZINOVIEFF

Sequel to Elementary Russian. Systematic review of Russian grammar. Continued training in speaking, understanding, reading, and writing Russian. *Prerequisite*: One year of Russian at college level, or equivalent.

### 2-299. Advanced Russian

Year, 3 credits each semester

VICTOR FEDIAY  
THEODOSIE SCALA

Reading and translation of more advanced Russian texts. Composition in Russian. Oral and written translation from English to Russian. *Prerequisite*: Two years of Russian at college level, or equivalent.

### 2-292. Scientific Russian I

Fall, 3 credits

TATIANA W. BOLDYREFF

Designed to develop reading knowledge of scientific Russian. No previous knowledge of Russian required.

### 2-294. Scientific Russian II

Spring, 3 credits

TATIANA W. BOLDYREFF

Designed to develop reading knowledge of scientific Russian. *Prerequisite*: Scientific Russian I, or equivalent.



## Spanish

### 2-300. Elementary Spanish

Year, 3 credits each semester

ERWIN JAFFE

Basic grammar and vocabulary. Foundation work in speaking, understanding, reading, and writing Spanish. For beginners.

### 2-301. Intermediate Spanish

Year, 3 credits each semester

JACOB ORNSTEIN

Sequel to Elementary Spanish. Systematic review of Spanish grammar. Continued training in speaking, understanding, reading, and writing Spanish. *Prerequisite*: One year of Spanish at college level, or equivalent.

### 2-302. Advanced Spanish Conversation and Composition

Year, 2 credits each semester

MANUEL M. STERLING

Designed to develop fluency in idiomatic conversation and to provide thorough training in the structure of the language. Grammar review only if deemed necessary. Writing of compositions commercial and familiar letters. Reading of current newspapers, magazines, and novels. *Prerequisite*: Intermediate Spanish, or equivalent.

### 2-83. Basic Conversational Spanish I

Fall, non-credit. Repeated in Spring and Summer

JOSÉ OTERO

Designed to impart elementary facility in everyday spoken Spanish. Through practice, the student learns to make himself understood and to follow conversations about family, meals, work, sports, travelling, and other common subjects. Useful for those planning to travel in a Spanish-speaking country. No previous knowledge of Spanish required.

### 2-84. Basic Conversational Spanish II

Fall, non-credit. Repeated in Spring and Summer

JOSÉ OTERO

Continuation of Basic Conversational Spanish. Continued practice in conversation to improve vocabulary and fluency. *Prerequisite*: Basic Conversational Spanish, or equivalent.

## Swahili

### 2-210. Elementary Swahili (1964-65 and alternate years)

Year, 3 credits each semester

JOHANNES G. MLELA

Introduction to sound system and structure of Swahili. Elementary conversation and reading.

### [2-211.] Intermediate Swahili (1965-66 and alternate years)

Year, 3 credits each semester

JOHANNES G. MLELA

Sequel to Elementary Swahili.

# Mathematics and Statistics

DEPARTMENTAL COMMITTEE

B. Ralph Stauber, *Chairman*

Jerome Cornfield, Joseph F. Daly, Morris H. Hansen, Earl E. Houseman, Jack Moshman, Walt R. Simmons

Unprecedented dependence is being placed on statisticians by administrative officials in Government and in private business all over the world. The statistician, through his specialized training, is able to provide current and comprehensive information as well as specialized judgment on many subjects, and to do so with speed and economy. By applying proper principles of design, he can insure securing the maximum amount of information from a given investment in an experiment or survey. His specialized knowledge and techniques are indispensable in both industry and in Government.

The making of a statistician is a long and exacting process. Several years of graduate study, and at least a year and a half of high-level experience under competent leadership are essential. Educational facilities are strained, not only because of the heavy and increasing demand, but also because the educational requirements placed on the statistician today are of an entirely different order of magnitude than only a few years ago.

Recent years have seen the addition of an array of computing aids that vastly expand the horizon of what is possible in statistical data handling and computation. Computational and data handling operations that were regarded as impossible or even fantastic a few years ago are now routine as a result of the development of the electronic computer. This means that the statistician must be familiar not only with the theoretical principles underlying statistical analysis and the design of surveys and experiments, together with the skills for carrying out the operational phases of such activities. He must also be familiar with the potentialities and application of modern-day equipment for carrying out the computational aspects of his activities.

Accordingly, the courses offered by the Department of Mathematics and Statistics include: Basic mathematics prerequisite to statistics courses, specialized mathematics related to statistics, a wide range of courses in statistics ranging from elementary to advanced, data processing on electronic computers, and supplementary subjects related to the statistical field.

## Certified Statement of Accomplishment in Statistics

A Certified Statement of Accomplishment in Statistics is granted to a student who has completed an organized program in one of three fields of statistical study, the social sciences, the natural sciences, or mathematical statistics. These represent areas of statistical preparation and application especially useful in the Federal Government. Completion of one of these programs prepares the student for effective public service in a particular field. Substitutions may be approved under appropriate circumstances.

### Requirements

1. An undergraduate degree
2. Basic courses required of all candidates: (15 credits) (for all fields)  
College Algebra (4)

Plane Trigonometry (2)  
 Analytic Geometry (2)  
 Calculus (4)  
 Principles of Statistical Analysis (3)

3. 24 semester hours of credit with an average grade of B or better in the following specialized and elective courses:

a. Specialized Courses:

Social Sciences

Mathematical Statistics (8)  
 Elementary Matrix Theory (6)  
 Sampling in Social and Economic Surveys (3) or Theory of Sample Surveys (4)  
 Introduction to Population Statistics (3)

Natural Sciences

Mathematical Statistics (8)  
 Statistics in Experimental Research (3)  
 Elementary Matrix Theory (6)  
 Design of Experiments in Biological Sciences (4)  
 or Introduction to Experimental Statistics (8)

Mathematical Statistics

Mathematical Statistics (8)  
 Elementary Matrix Theory (6)  
 Theory of Sample Surveys (4)  
 Introduction to Probability Theory (6)  
 A course in programming an electronic digital computer

b. Elective Courses:

Differential Equations (4)  
 Introduction to Linear Programming (3)  
 Introduction to Operations Research I and II (6)  
 Mathematical Methods and Theory in Games and Programming (3)  
 Non-sampling Errors in Statistical Surveys (2)  
 Statistics in Experimental Research (3)

*A student seeking this certified statement should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. Equivalent courses will be accepted by transfer from other institutions.*

## Mathematics

### 3-8. Intermediate Algebra

Fall, non-credit. Repeated in Spring and Summer

REX G. BUTLER  
 STEWART B. FOX, JR.  
 EDWARD J. MCGRANE

Designed primarily for the student with limited background in algebra, or who has been away from algebra for a number of years and needs a refresher course. Fundamental operations of addition, subtraction, multiplication, and division. Factoring. Fractions. Linear equations in one unknown. Functions and their graphs. Systems of linear equations. Exponents and radicals. Quadratic equations. Ratio, proportion, and variation. Arithmetic and geometric progressions. Logarithms. Binomial theorem.

## 6-423. Mathematics of Accounting and Investment

(See P. 77)

## 3-1. Review of College Freshman Mathematics

Year, non-credit

ANTHONY T. DIAMOND

Review at level of college Freshman mathematics. Algebra, trigonometry, and analytic geometry. Brief introduction to methods of the differential calculus. Emphasis on applications to statistical problems. *Prerequisite*: One year of college mathematics.

## 3-2. Review of Calculus

Spring, non-credit. Repeated in Summer

J. RICHARD GAUTHEY  
PAUL A. GISVOLD  
WILLIAM J. HUSSONG, JR.  
KEITH G. LAKEY

Variables, functions, limits, divided differences, derivatives, application of derivatives to geometry as well as engineering curve fitting and analysis. Transcendental functions, polar equations, differentials, mean value theorem, techniques of integration, and engineering application. Series and expansion of functions. *Prerequisite*: Calculus.

## 3-102. College Algebra

Fall, 4 credits. Repeated in Spring

NATHAN GORDON  
JAMES B. MCCURLEY

Number system of algebra. Algebraic expressions. Elementary graphical methods. Operations with polynomials. Fractional expressions. Linear equations. Fractional exponents. Radicals and complex numbers. Quadratic equations. Systems of equations in two unknowns involving quadratics. Ratio, proportion, and variation. Theory of equations. Determinants. Solution of equations by inverse matrix. Permutations, combinations, and probability. Binomial theorem. Progressions. Infinite geometric series. Inequalities. Logarithms. Mathematics of investment. *Prerequisites*: High school algebra and plane geometry.

## 3-100. Introduction to Modern Algebra

Fall, 3 credits. Repeated in Spring

WESLEY E. SANBURN

Sets: Mappings and operations and relations. Axiomatic number system and induction. General algebraic systems. Groups. Rings. Vector spaces. Boolean algebras. *Prerequisite*: College algebra. Knowledge of logic and/or set theory helpful.

## 3-103. Trigonometry and Analytic Geometry

Fall, 4 credits. Repeated in Spring

JOSEPH L. STEARN

Basic definitions and uses of trigonometric functions. Logarithmic solutions. Radian measure. Fundamental identities. Oblique triangles. Polar coordinates and inverse trigonometric functions. Complex numbers and De Moivre's theorem. Graphs of functions and inverse functions. Introduction to spherical trigonometry. Fundamental concepts and formulas. Line, circle, parabola, ellipse, and hyperbola. Transformation of coordinates. Polar coordinates. Parametric equations. Second and higher degree equation in rectangular coordinates. Graphic solution of equations. Introduction to solid analytic geometry. *Prerequisite*: College algebra.

## 3-104. Trigonometry

Summer, 2 credits

JOSEPH L. STEARN

Basic definitions and uses of trigonometric functions. Logarithmic solutions. Radian measure. Fundamental identities. Oblique triangles. Polar coordinates. Inverse trigonometric functions. Complex numbers and De Moivre's theorem. Graphs of functions and inverse functions. Introduction to spherical trigonometry. *Prerequisite*: College algebra.



### 3-206. Calculus

Year, 4 credits each semester

J. RICHARD GAUTHEY  
PAUL A. GISVOLD  
WILLIAM J. HUSSONG, JR.  
KEITH G. LAKEY  
CHARLES E. SLONIM

First semester: Variables, functions, limits, continuity, derivatives. Applications of the derivative to geometry and physics. Maxima and minima. Differentials. Mean value theorem. Simple integration and applications to geometry and physics. Radius and circle of curvature. Vectors. Second semester: Standard integral forms. Special methods of integration. Approximate integration. Improper integrals. Indeterminate forms. Taylor's formula with remainder. Infinite series. Partial derivatives. Multiple integrals. Hyperbolic functions. Introduction to differential equations. *Prerequisites*: College algebra, trigonometry, and analytic geometry.

### 3-500. Advanced Calculus

Year, 3 credits each semester

J. RICHARD GAUTHEY

First semester: Covers some principal analytical tools of science and engineering. Typical applications discussed throughout course. Differential and integral applications of functions of several variables. Infinite series and power series expansions. Gamma, Beta, and Bessel functions. Fourier series and integral. Fundamental operations with vectors, linear vector spaces, and introduction to vector field theory including line and surface integrals. Second semester: Dimensional analysis. Complex variables: Analytic functions, integrals, power series, residues, and conformal mapping. LePlace and related transforms. Stieltje integrals.

### 3-310. Introduction to Probability Theory

Year, 3 credits each semester

MORTON S. RAFF

Designed for research workers wanting introduction to probability theory and its application to statistical technique. Historical development of various definitions and philosophic points of view of probability and their practical implications for subject-matter application. Elementary theory of sets, combinatorial analysis, conditional probability and Bayes's Rule, discrete and continuous distribution functions, and random variables. Sums of random variables, variance of sums, generating functions, testing of hypotheses, and estimation of parameters. *Prerequisite*: One year of calculus.

### 3-315. Introduction to Modern Mathematics

Spring, 3 credits

EARL F. CLARK  
Y. S. SATHE

Modern approach to basic ideas of mathematics, with scientific applications. Finite situations and logical relations as basis for introduction to and consideration of sets and subsets, probability, statistics, vectors and matrices, and game theory, with applications to biological and social scientific problems. *Prerequisites*: College algebra, trigonometry, and analytic geometry.

### 3-415. Elementary Matrix Theory

Year, 3 credits each semester

LAWRENCE A. GAMBINO

Matrix algebra. Determinent theory. Inverse of matrix, rank, and equivalence. Linear equations and linear dependence. Vector spaces and linear transformations. Characteristic equation of matrix. Bilinear and quadratic forms. *Prerequisite*: Ability to reason, usually acquired in one or two years of college mathematics.

### 3-502. Differential Equations

Year, 2 credits each semester

EDWARD J. McGRANE

Nature and origin of differential equations. Standard methods of solving ordinary differential equations with sample applications. Linear differential equations with constant coefficients and applications to topics selected by students. Existence and uniqueness of solutions. Simultaneous equations and operational methods. Solutions by power series and methods of Taylor, Picard, and Frobenius. Numerical solution. Partial differential equations and solution of boundary-value problems by Fourier series. Review of calculus as necessary. *Prerequisites*: Differential and integral calculus.

### 3-508. Theory of Errors

Fall, 3 credits

JOSEPH L. STEARN

Basic concepts in theory of errors and their application to problems in engineering. Designed to give the student sufficient background to find solutions to problems in error theory and least squares. Classification of errors, the Gaussian law of error, normal distribution, rectangular distribution, measures of precision, propagation of errors, method of least squares as applied to observation and condition equations, design of significance tests for acceptance or rejection of observations, simultaneous solution of observation and condition equations, variance-covariance matrix, and alternatives to least squares. First three weeks devoted to introduction to basic fundamentals of matrix calculus. *Prerequisite*: Calculus.

### 3-509. Mathematics for Economists

Year, 3 credits each semester

ANTHONY S. ROJKO

Aspects of mathematics most useful to economists: Algebra, geometry, differential and integral calculus, differential and difference equations, and matrix algebra. At each stage, use of described mathematical methods to solve problems based on economic theory or analysis. Demonstration of applications of these techniques in fitting equations by least squares, in fitting systems of simultaneous equations, and in using such systems for analytical purposes. *Prerequisites*: Principles of Economics, college algebra, or special permission.

### 8-406. Engineering Mathematics

(See P. 91)

### 3-532. Introduction to Linear Programming

Fall, 3 credits

VICTOR E. BACH

Basic theoretical, computational, and applied aspects of linear programming. Background for recognition of problems of linear programming nature, formulation of such problems as linear programming models, and use of proper computational techniques to solve these problems. Understanding of mathematical aspects tying together these elements of linear programming. General linear programming problem, simplex computational procedure, duality theorems of linear programming, transportation problem, assignment problems, production scheduling problems, diet problems, additional applications, relationship between the zero-sum two-person game and linear programming, parametric linear programming, and recent developments. Introductory lectures on matrices, vectors and vector spaces, convex sets, and linear inequalities. *Prerequisite*: Two years of college mathematics.

### 3-541. Mathematical Methods and Theory in Games and Programming

Spring, 3 credits

VICTOR E. BACH

Aspects of theory, technique, and application in selected areas of game theory, non-linear programming, and dynamic programming. Two person, n-person, and infinite games. Concave programming and duality in non-linear programming. Dynamic programming processes. Multi-stage processes and games. Emphasis on use of theory as tool in applied problem solving. *Prerequisite*: Introduction to Linear Programming, or equivalent.

### 3-533. Introduction to Operations Research I

Fall, 3 credits

LEON H. MILLER, JR.

Study of methods and philosophies of operations research. Survey of models representing following systems: Allocation of resources (linear programming). Waiting line. Inventory and game and replacement theories. *Prerequisites*: Calculus and statistics.

### 3-534. Introduction to Operations Research II

Spring, 3 credits

LEON H. MILLER, JR.

Continuation of Introduction to Operations Research I. Topics: Decision theory, Markov processes, dynamic programming, simulation, sequencing, and management games. Applications of operations research to industrial, government, and military problems. *Prerequisites*: Calculus and statistics. *Operations Research I is not required for admission to this course.*

### [3-590.] Introduction to Cybernetics (1965-66 and alternate years)

Fall, 3 credits

MICHAEL J. PEDELTY

Introductory course for those interested in problems of communication and control in man-made and living systems. Emphasis on fundamentals. Examples drawn from machine control, error-correcting and reliability, control of armed force, labor force, economy, or manufacturing process, control by an organism of physiological "essential variables," and psychotherapy. Control as goal-directed process. Message transmission as selection process. Message reception as biasing of selection process. Law of requisite variety. Very large system. Fundamental limitations on degree of control attainable by scientists or automation. *Prerequisite*: Introduction to Modern Mathematics, or special permission.

### 3-730. Theory of Graphs

Fall, 3 credits

THOMAS L. SAATY

Theory of graphs with application to mathematics and operations research. Linear programming in terms of network flow. Intuition aided by geometry of graphs. *Prerequisites*: Elementary background in set theory and some experience with mathematical concepts. Rudimentary knowledge of matrices desirable.

### 3-707. Topics in Non-Linear Mathematics

Spring, 3 credits

THOMAS L. SAATY

Emphasis on rapidly developing field of modern applied mathematics. Occurrence of linearity and non-linearity in mathematics. Non-linear algebraic equations. Non-linear differential, difference, and integral equations. Stability theory. Control theory. Non-linear prediction. *Prerequisites*: Advanced calculus and differential equations.

### 3-711. Automata Theory and Neuromimes (1964-65 and alternate years)

Spring, 2 credits

MICHAEL J. PEDELTY

Theories of information processing, artificial intelligence, and automata theory. Review of set theory and probability theory. Lattices, partitions, and operations on Boolean lattices. Machine intelligence and its implications for design philosophy. Information theory. Information interface in intelligent decision making. Threshold functions, linear separability, reliability, plastic neurons, and need for inhibition. Neurons in real-time control. Conditional probability computers. Functional degeneracy. Probability state variable devices. Error correction and noisy computation channel. Future for communication. Topics from cybernetics and general systems theory. *Prerequisite*: Introduction to Cybernetics, or knowledge of logical design of computers.

## Statistics

### 3-6. Preparatory Mathematics for Introductory Statistics

Fall, non-credit. Repeated in Spring and Summer

WILLIAM E. KIBLER

TERRY B. KINNEY, JR.

For the student with inadequate mathematical background who desires to study statistics at introductory level. Basic operations of algebra, fractions, exponents, summation notation, manipulation of algebraic expression, logarithms, graphic representation of equations, solution of simultaneous equations, elements of probability, permutations and combinations, and mathematical expectation. Emphasis on algebra used in statistics. Examples and problems primarily from statistical operations. *Prerequisite*: High school algebra.

### 3-126. Introductory Statistics

Year, 2 credits each semester. Repeated in Spring and Summer

QUENTIN M. WEST

JO BRICE WILMETH

Collection of data. Presentation of data in tables and charts. Different kinds of averages. Dispersion. Introduction to index numbers. Relations between two or more variables. Introduc-



tion to correlation theory, regression, and interpretation of samples. Practice in calculations. *Prerequisites*: High school algebra and geometry.

### 3-136. Graphic Methods of Presenting Statistics

Fall, 2 credits

NELSON P. GUIDRY

Analysis of statistical data to determine best form for graphic presentation. Application of data to many types of illustrations in several forms of various classes. Preparation of rough pencil layout examples of time series charts, frequency diagrams, graphic correlation charts, pictorial symbol charts, cartograms, and other illustrative examples. Analysis of comparability and evaluation of individual charts and maps in series.

### 3-318. Machine Tabulation I

Fall, 2 credits. Repeated in Spring

INSTRUCTOR TO BE ANNOUNCED

Designed principally for accountants, operators of punch card tabulating equipment, and statisticians. Principles of operation, functions, applications, and limitations of various types of IBM equipment such as card punching and verifying machines (including types 24 and 26), sorters, alphabetic accounting machine (type 402), reproducing punches, and other auxiliary machines. *Instruction in basic wiring of machines*. Alphabetic accounting machine (type 402). Principal Remington Rand punch card tabulating equipment. *Not intended to train in physical operation of machines*.

### 3-319. Machine Tabulation II

Spring, 2 credits

INSTRUCTOR TO BE ANNOUNCED

Designed principally for accountants, operators, statisticians, and supervisors of punch card tabulating equipment. Principles of operation and functions of IBM accounting machines, type 407, and the collating machines, types 77 and 89. *Instruction in wiring of machines including solution of advanced wiring problems*. *Prerequisite*: Machine Tabulation I, or knowledge of basic wiring of tabulating equipment.

### 3-380. Principles of Statistical Analysis

Year, 3 credits each semester

B. RALPH STAUBER

Foundation for basic concepts and principles of statistical analysis, and development of understanding of their application to scientific investigation. Elementary probability. Binomial, Poisson, and normal distributions. Introduction to sampling. Statistical tests of significance. Simple and multiple correlation. Some theory of determinants with applications to correlation and the inverse matrix. Introduction to analysis of variance and covariance. Elementary principles of design and analysis of surveys and experiments. Use of statistical tables by Fisher, Yates, and others. *Prerequisites*: Working knowledge of algebra, trigonometry, and analytic geometry. Elementary statistics desirable.

### 3-385. Elements of Statistical Methods

Year, 2 credits each semester

RICHARD P. LEHMANN

Principles underlying statistical methods with particular reference to natural and physical sciences. Elementary probability, distribution of discontinuous and continuous variables, statistics versus parameters, chi-square test, "t" test, correlation, regression, analysis of variance and covariance, and meaning of experimental error and statistical inference. *Prerequisite*: College training in agriculture or biological sciences. College algebra helpful.

### 3-400. Mathematical Statistics

Year, 4 credits each semester

EDWARD L. MELNICK

Theory of statistics with introduction to probability theory and statistical inference. Sample space, sets, and events. Axiomatic theory of probability. Marginal and conditional probability. Bayes' Theorem. Discrete and continuous probability functions. Expectation. Moments and moment generating functions. Hypergeometric, binomial, poisson, normal, gamma, and beta distributions. Sampling statistics. Limit theorems. Sampling distributions, Chi-square, Snedecor's F



and student's *t*. Decision theory, estimation, properties of point estimators, Cramer-Rao inequality, maximum likelihood, confidence interval estimation, testing hypotheses, Neyman-Pearson principle, and likelihood ratio. Regression and linear hypotheses. Multivariate normal distribution. Order statistics. Applications in assigned problems reviewed in class. *Prerequisites*: Calculus and Introductory Statistics, or special permission.

### 3-405. Statistics in Experimental Research

Fall, 3 credits

HAROLD F. HUDDLESTON

Nonmathematical course in design, analysis, and interpretation of data from experiments or surveys. Elementary probability relationships, concept of sampling error, determination of sample size, tests of hypotheses for two or more sample means, uses of chi-square, analysis of variance and covariance, and individual degrees of freedom. Basic design principles of completely randomized, randomized block, Latin square, split plot, incomplete blocks, factorials, and confounding. *Prerequisite*: Recent course in elementary statistical methods, or familiarity with ordinary methods of tabulating experimental data, or special permission.

### 3-435. Sampling in Social and Economic Surveys (1964-65 and alternate years)

Fall, 3 credits

HAROLD NISSELSON

Nonmathematical survey of sampling theory and practice. Development of basic ideas of statistical sampling, with applications in social and economic surveys. Unrestricted random, stratified, systematic, area and cluster sampling, and subsampling. Discussion of sample designs used in United States and in foreign countries with respect to considerations of statistical efficiency, cost functions, and the administrative limitations imposed on design. *Prerequisite*: Elementary statistics.

### 3-450. Introduction to Population Statistics

Fall, 3 credits

JACOB S. SIEGEL

Principal sources of population data. Collection and processing of demographic data. Problems of census taking. Measuring quality of population data. Basic methods of measuring and analyzing population size, geographic distribution, composition (age, sex, race, and ethnic composition) and dynamics (natality, mortality, reproductivity, and migration). Principal demographic rates, including crude and adjusted rates. General methods such as standardization, cohort analysis, and interpolation. Nature and use of life tables. Population estimates and projections. *Prerequisites*: Elementary statistics and course in social sciences.

### 6-343. Statistical Sampling for Financial Management (See P. 76)

### 1-570. Design of Experiments in Biological Sciences (See P. 14)

### 3-735. Theory of Sample Surveys

Year, 2 credits each semester

JOSEPH STEINBERG

History of sampling in social surveys. Use of statistical control in improving quality and efficiency of estimates. Calculation of sampling errors. Random, stratified random, purposive, double and systematic sampling. Cost function and choice of sampling unit. Size and type of sample necessary to attain stated degree of precision. Distinction between precision and accuracy. Development of theory of probability as necessary. Contributions of Fisher, Neyman, Yates, Cochran, and others. *Prerequisites*: Calculus and Principles of Statistical Analysis.

### [3-736.] Non-sampling Errors in Statistical Surveys (1965-66 and alternate years)

Fall, 2 credits

LEON PRITZKER

Identification, measurement, and control of errors in reporting and processing statistical data. Mathematical models of non-sampling errors. Identification and measurement of components of response variance and response bias. Identification of sources and components of nonsampling errors. Application to optimum design of survey procedure. *Prerequisites:* Introduction to Mathematical Statistics, or Theory of Sample Surveys, and professional work in survey design or experimental design.

## 3-025. Federal Statistical Services

Fall, non-credit

WALTER F. RYAN

Federal statistical system: its growth, organization, major characteristics, and functions. Four lecture-seminars meeting from 3:30 to 5:00 P.M. on September 23, October 7, October 21, and November 4. Registration required, but no fees charged.

## Automatic Data Processing

### 4-105. Basic Concepts of Data Processing (See P. 46)

### 3-559. Electronic Data Processing—General

Year, 3 credits each semester

JOSEPH F. CAMPAGNA  
DOUGLAS D. LOTTRIDGE  
ARTHUR E. NEWMAN

Designed for subject-matter professional workers desiring technically based understanding of techniques, potentials, and problems of exploiting electronic data processing in their fields. First semester: Oriented mainly to equipment. Organization and components of EDP systems. Programming concepts in machine language and in symbolic representation of machine language. Input-output. Arithmetic. Program logic and control. Distinctions among kinds of machines. Second semester: Oriented mainly to uses. Systems analysis and flow charting. Automatic programming (ForTran, Algol, COBOL, and Tabsol). Representative applications in the Federal Government. Accounting. Statistics. Scientific computation. Information storage and retrieval. Advanced potentials of EDP.

### 3-552. Data Processing on Electronic Computers—UNIVAC 1105

Year, 3 credits each semester

LEONARD D. MCGANN

First semester: Basic principles of data processing on large-scale digital electronic computers. Number systems. Flow charting. Instruction repertoire for 1105. Function and use of peripheral equipment. Basic programming techniques. Tour of computer installation. Second semester: Input-output logic. Magnetic tapes. Symbolic coding. Compilers, generators, subroutine libraries, and service routines. Solving business problem on 1105. *Prerequisites:* Experience in problem analysis. No computer experience necessary.

### 3-568. Data Processing on Electronic Computers—UNIVAC 1107

Year, 3 credits each semester

JOHN K. HENDERSON

First semester: Instruction repertoire and peripheral equipment. Second semester: Input-output logic and related software. *Prerequisites:* Mathematical maturity and experience in problem analysis. No computer experience necessary.

### 3-578. IBM 360 Data Processing System

Year, 3 credits each semester

JOHN A. TAYLOR

Basic information on IBM 360 system. Objective to provide general understanding of system and interrelationship of models and parts. Broad system concepts, basic and optional features, and specific input-output devices. Operating principles, central processing unit, instructions and programming (basic assembly program and applications of Cobol and Fortran).

### 3-585. Data Processing on Electronic Computers—IBM 1401

Three semesters, 3 credits each semester

ROBERT H. ARMSTRONG  
ANNE H. EASTMAN  
MAITLAND K. FLOOD  
ANN B. HIBAN  
JUDITH P. JOHNSON  
JOHN W. MORTON  
HUBERT P. NUCCI  
ALBERT J. NOWOTNY  
JOHN A. TAYLOR  
JACQUELYN ZEHRING

First semester: Components, operation, and capabilities of 1401 system. Flow charts. Instructional format, machine instructions, and their incorporation into 1401 card system programs. Address modification. Autocoder. Second semester: Tape processing and random access techniques, with emphasis on programming. Tape sorting. Utility programs. Third semester: Macro instructions. IOCS, RPG, Cobol, and Fortran as related to 1401 systems. Compatibility problems. *Prerequisites:* Experience in accounting, or punch card machine work, or statistical data processing, or systems analysis.

### 3-588. Data Processing on Electronic Computers—IBM 1410

Year, 2 credits each semester

JOAN G. ADOFF  
KENNETH G. CLOSE  
LOUIS ZELLER

First semester: Introduction to high-speed data processing system. Input/output components. Computer capabilities. Repertoire, format, and execution of machine commands. Preparation of flow charts. Writing of detailed program instructions, using both absolute and symbolic language. Second semester: Program loading and testing procedures. Data processing with magnetic tape. Macro instructions. General purpose input-output package routines. Systematizing a data processing project. Automatic programming systems. *Prerequisites:* Training or experience in accounting or statistical fields, or with other stored program digital computers.

### 3-580. Data Processing on Medium-Sized Advanced Electronic Computers—IBM 7070

Year, 3 credits each semester

THEODORE W. MERRILL

First semester: Concepts of high-speed digital-stored program computer utilizing advanced technology. Basic arithmetic, logical operations, and introduction to indexing. Basic assembly system, Autocoder basic. Basic programming techniques, flow charting, and problem analysis. Sample problems. Second semester: More detailed discussion of material covered in first semester. Use of magnetic tape as input-output media for tape-oriented 7070. Automatic priority processing, interrupt features, zero elimination, and scatter gather. New concepts involved in using advanced input-output systems. Survey of other programming languages and systems. *Prerequisite:* Accounting or statistical data processing. Training in other stored programmed computers desirable.

### 3-581. Programming Large-Scale Data Processing System—IBM 7090

Year, 3 credits each semester

THEODORE W. MERRILL

First semester: Machine organization. Arithmetic operations. Transfer operations. Logic operations. Indexing. Basic input-output. Second semester: Optional input-output devices Input-output control system. Programming and/or operating system. Cobol. Fortran. Modular programming. *Prerequisite:* Accounting or statistical data processing. Training in other stored programmed computers desirable.



### 3-595. Cobol Programming—Fundamentals

Fall, 3 credits. Repeated in Spring

ROBERT M. STEINBERG

How to write Cobol programs. Computer concepts. Role of compiler. Step-by-step development of Cobol language and its application. Debugging Cobol program. Systems analysis for Cobol programming. Laboratory exercises in class. Previous knowledge of computers or programming not necessary. *Prerequisite*: Basic Concepts of Data Processing, or equivalent.

### 3-589. Fortran Programming for Scientific and Business Computers

Fall, 3 credits. Repeated in Spring

GARY D. BEARDEN

Complete programming system, emphasizing major applications in scientific and engineering fields, using Fortran programming language. IBM 7074 as prototype. Indication of instructions applicable to other computers. Basic components. Flow of control. Flow diagramming. Floating point arithmetic. Constants. Variables. Forming expressions in Fortran. Looping instructions. Input-output instructions. Format control. Logic instructions. Subroutines. Arithmetic functions. *Prerequisites*: Two years college mathematics and/or statistics, or one year college mathematics and one year experience in programming scientific or business computers.

### 3-760. Programming Techniques for General Purpose Electronic Digital Computer—Scientific Applications

Year, 3 credits each semester

GEORGE L. GRESSETT

IBM 7090 as prototype for programming single address, general purpose, stored program, digital information processor, with emphasis on scientific applications. First semester: Stored program computer concepts. Nature and ability of computers. Basic components. Flow of control. Flow diagramming. Instruction repertoire. Symbolic coding techniques using Macro-Assembly Program (MAP). Machine decisions. Address modification. Indexing, counting, and looping. Number systems. Floating point. Macro-operations. Open and closed subroutines. Input-output. Second semester: Continuation of input-output. Compilers and assemblers. Fortran IV programming language. Monitors with emphasis on IBSYS. Tour of computer installation. *Prerequisites*: Two years college mathematics, including calculus and linear algebra, or special permission. No computer experience necessary.

### 3-762. Electronic Computer Methods for Statisticians

Fall, 3 credits. Repeated in Spring

M. H. SCHWARTZ

Designed to provide statistical workers basis for developing programming and other computer skills and to provide statistical administrators powerful understanding of computer potentials, problems, and limitations. Machine concepts. Organizing data for computer processing. Writing and testing programs. Numerical analysis. Computational procedures. Subroutines. "Canned" library programs. Programming organization. Systems planning for statistical data processing. Cross-section topics: Tabulating, computing summary statistics, multivariate association, and measures of significance. Time series topics: Computing measures of seasonal cycle and growth, index numbers, and correlation. *Prerequisites*: Undergraduate degree and at least Introductory Statistics, or equivalent.

2-285. Writing for Data Processing Installations (*See P. 23*)

7-464. Computers in Behavioral Sciences (*See P. 86*)

8-682. Elements of Digital Data Processing (*See P. 91*)

8-685. Engineering Applications of Digital Computers  
(*See P. 91*)



# Office Techniques and Operations

DEPARTMENTAL COMMITTEE

FRANK H. SPENCER, *Chairman*

Shirley Barlow, Henry A. Donovan, Robert H. Fuchs, Kelsey B. Gardner, Mark M. Kirkham, Terry J. McAdams (*Vice-chairman*), Max P. Reid, Edmund Stephens, William T. Wolfrey

Whatever the fields of interest of the organization—science, technology, public administration, private business—and whether huge in size or small, all depend upon the office worker to facilitate their functions. All workers are important: the stenographer, the clerk preparing purchase orders, the bookkeeper keeping the accounts in order, the clerk skilled in personnel actions, the worker in records management. And the supervisor who is immediately responsible for these various activities is indispensable to the organization.

It is in recognition of the vital importance of adequately trained personnel to fill these needs and to provide opportunity for supplemental and refresher courses in this general field that the Department of Office Techniques and Operations offers the following courses. They are in large measure practical, how-to-do-it courses of interest generally to persons working with these procedures, or who hope to train themselves for such positions. Of course, these courses are also helpful to persons such as supervisors and administrative assistants in positions requiring some familiarity with these procedures and also to persons of higher levels of responsibility who desire to know more of the details of these operations.

## CERTIFIED STATEMENT OF ACCOMPLISHMENT IN ADMINISTRATIVE PROCEDURES

A Certified Statement of Accomplishment in Administrative Procedures is granted to a student who has completed an organized program designed to provide basic training in administrative procedures. This program should be of special interest to those already employed in administrative work of the procedural type, those who wish to enter administrative work, and those who wish to become administrative assistants or to head units concerned with administrative procedures. An applicant for the certified statement must file a transcript of his high school or college record before completion of his program.

### Requirements

1. Graduation from high school.
2. 16 semester hours of credit with the grade of C or better in each of the courses taken:
  - a. Required courses: (10 credits)  
American National Government (3)  
7 semester hours from courses above 100 level in Office Techniques and Operations or Public Administration. Courses in accounting may not be included, except for Federal Fiscal Procedure and Federal Government Accounting.
  - b. Elective courses: (6 credits)  
Remaining hours of credit may be selected from other courses in Office Techniques and Operations, excluding shorthand. Elementary statistics and a course in automatic data processing may be included.

*A student seeking this certificate should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. Equivalent courses will be accepted by transfer from other institutions.*

## Administrative Procedures

### 4-101. Everyday Mathematics

Fall, 2 credits. Repeated in Spring and Summer

C. M. MOUSER

Designed for clerical workers called upon to apply fundamentals of arithmetic to their jobs. Emphasis on review of business arithmetic, including fractions, decimals, ratios, and percentages. Special applications to Civil Service and business problems such as bank, cash, and trade discount, profit and loss, payrolls, simple and compound interest, fire insurance, stocks and bonds, property and income taxes, and determination of interest rates charged on time purchases and small loans.

### 3-8. Intermediate Algebra

(See P. 35)

### 4-105. Basic Concepts of Data Processing

Fall, 3 credits. Repeated in Spring and Summer

CHARLES J. AUSTIN  
JOHN N. M. N. DERUYTER  
GLENN W. SUTER  
RICHARD M. SWINK

Designed to introduce data processing to the student entirely new to the field. Examination of areas of understanding required by nonprofessionals or those interested in programming instruction, but without background experience. Topics: Punched card data processing. Coding systems. Computer and stored program concepts. Data preparation and print-out formats. Methods of problem definition. Data processing terminology. Illustrations of work done by various kinds of equipment and tour of data processing installation.

### 4-108. Administrative Procedure

Fall, 2 credits. Repeated in Spring and Summer

THOMAS J. HICKEY  
CLAUDE R. WRIGHT

Designed for the student who wishes to become a supervisor or administrative assistant, or who has such a position in a small organizational unit. Day-to-day assignments in such units. Preparation of budget data, proper establishment of authority and responsibility, organizational structure, fundamentals of personnel administration, and requirements essential for good supervision. Introduction to administrative planning, administrative procedures, and management generally at lowest organization level, including work reporting and work measurements, work processes, and work control reports. Relation of these studies to budgetary and personnel needs of unit. Theory of staff versus operating jurisdiction over administrative planning.

### 4-201. Modern Supervisory Practice

Fall, 2 credits. Repeated in Spring

WILLIAM R. VAN DERSAL  
NORMAN A. BERG

Designed for supervisors or those interested in becoming supervisors. Study and application of principles of supervision, supervisory techniques, participation, motivation, communications, organization principles, workload analysis, planning, scheduling, work improvement studies, and solving problem cases prepared by students.

### 6-202. Management—Seminar

(See P. 67)

## 4-206. Essentials of Good Office Management

Fall, 3 credits. Repeated in Spring

GLENN D. WAGNER

Designed to give better understanding of principles and techniques of effective management and their practical applications. Review of current research and thinking. Comparison of practices in Government and industry. Problems and questions relating to office management: organizing for effective operations, planning and control of work, utilization of office equipment and services, paper-work management, human relations problems, coordinated effort and team work, and effecting improvements.

## 4-207. Modern Office Management

Summer, 2 credits

GLENN D. WAGNER

Review and discussion of principles and problems of management in office, with emphasis on new developments and trends, including office systems, new management tools, productivity, cost reduction, and others. *Prerequisites:* Some background courses or experience in office or administrative management.

## 4-112. Federal Fiscal Procedure

Year, 2 credits each semester

LOUISE M. KRUEGER

Intended to provide comprehensive understanding of basic fiscal and accounting laws, rules and regulations of the Federal Government and their application to specific fiscal activities. Relationship of executive departments with staff agencies, basic fiscal procedural sources. Covers in detail each type of fiscal operation, including use and processing of accounting and fiscal forms, disbursements and collections, and related records and reporting. First semester: General background of laws and regulations. Symbolization of accounts. Processing of payrolls. Handling of leave, retirement, tax, and bonds, and administrative examination of travel and transportation payments. Second semester: Continuation of study of basic laws, rules and regulations covering fiscal and accounting activities, with emphasis on procedures involving disbursements for supplies, equipment, utilities, and other items, use of imprest funds and agent cashiers. Handling of billings, collections, and deposits. Effecting adjustments for errors. Handling claims and uncollectible debts. Responsibilities of certifying officers.

## 4-113. Federal Property Procedure

Spring, 2 credits

RALPH G. MCINTYRE

For those in personal property work or who wish to enter field. Laws, regulations, principles, and procedures dealing with accountability and control, utilization, and disposal of Federal personal property. Accountability systems, capitalization policies, inventory controls, reports, surveys, and inspections. Development and application of use, replacement, and preventive maintenance standards. Disposal by transfer, donation, sale, abandonment, and destruction.

## 4-114. Federal Personnel Procedure

Fall, 2 credits. Repeated in Spring and Summer

HENRY C. STARNES

Elementary principles and procedures of Federal personnel administration, including study of Federal personnel structure and organization, rules and regulations of the Civil Service Commission, and other basic procedural sources. Use of personnel forms and records. Civil Service examinations and recruitment. Appointments. Transfers. Promotions. Separations and reductions in force. Suspensions and disciplinary actions. Retirement. Performance ratings. Leave and hours of duty.

## 4-115. Federal Purchasing Procedure

Fall, 2 credits. Repeated in Spring

TONY M. BALDAUF

For those in purchasing work or who wish to enter field. Historical and legal background of Federal purchasing, professional concepts in purchasing, current legal requirements, purchasing procedures from open market and Federal sources of supply, and purchasing techniques. Practical application of such requirements through the preparation of purchase documents. Case problems involving legal or administrative restrictions, or requiring application of purchasing principles.



## 4-116. Federal Budgetary Procedure: Formulation and Presentation

Fall, 2 credits

ALBERT J. KLIMAN  
DALE McOMBER

Designed for the student in budget work, up to and including GS-9, those intending to enter budget work, or others in related fields (accounting, auditing, and the like), interested in development phase of budget procedure. Basic legal and institutional framework, concepts, procedures, and practices involved in preparation of budget estimates, justifications and supplementary materials. Emphasis on budget procedures at bureau or small agency level. Preparation of budget estimate for hypothetical government agency. *Prerequisite:* Familiarity with basic concepts and terminology used in fiscal, accounting, or other financial operations of the Federal Government.

## 4-118. Federal Budgetary Procedure: Execution and Fund Control

Spring, 2 credits

BRINLEY J. LEWIS  
HERBERT G. PERSIL

Designed for the student in budget work, up to and including Grade GS-9, those interested in entering budget work, or others in related fields interested in performance phase of budget procedure. Systems of administrative control under the Antideficiency Act, allotments, apportionments, review of progress in relation to financial plans, related reports, and other aspects of budgetary control over appropriations and funds. Problems and discussion illustrating various steps of budget execution process at bureau or small agency level and review of basic laws, regulations, concepts, and terminology involved.

## 4-117. Records Management Procedure

Fall, 2 credits

DOROTHY M. LUTTRELL and ROBERT H. LANDO

Introduction to management of records. Basic instruction in processing, maintaining, and servicing records. Designed for the student interested in supplementing his knowledge of mechanics and techniques of records operations, or who desires to enter records management field. Theory and structure of various systems of classifying and filing records. Selection of filing systems based on identification of features of papers and needs of users. Selection and proper use of filing equipment and supplies. How to meet needs of management for documentation and information from records. Detailed instruction in methods of recording and controlling communications. Classifying, coding, indexing, and filing correspondence and other record material. Reference service, including establishment and operation of charge-out and follow-up systems.

## 4-217. Advanced Records Management

Spring, 2 credits

DOROTHY M. LUTTRELL and ROBERT H. LANDO

Advanced records management. Lectures on applicable management principles and techniques, group discussions of paperwork problems, and case studies illustrating practical solutions. History of growth of Federal records, increase of related paperwork problems, and Government efforts to solve them. Federal laws and regulations governing establishment, maintenance, protection, preservation, and disposal of records. Development and evaluation of records management programs, planning and conduct of records management surveys, inventory and evaluation of records, application of management problems and techniques to records maintenance and disposition problems, development and application of records retention and disposal standards, and retirement, storage, microfilming, and disposal of records. *Prerequisite:* Records Management Procedure, or qualifying experience at Grade GS-5 or above, or special permission.

## 4-410. Management of Directives Systems

Fall, 2 credits

CHARLES E. WYLIE

Review of basic systems of instruction- and order-communication in an agency. Emphasis on developing, installing, and operating agency directives management system. Study and case-work on theory and practices encountered in running a directives management shop. Relationships with other staff services and systems. Types and uses of directives. Numbering and reference systems. Proc-



essing directives from planning to approval. Preparation of masters. Reproduction and distribution. Transmittal and maintenance control systems. Designed for personnel with staff or coordinating responsibilities, including directives management activities. Also for those in charge of directives management operation or working in some major phase of directives management operation, who wish to broaden their knowledge and effectiveness.

## 4-412. Reports and Forms Management

Fall, 2 credits. Repeated in Spring

WILLIAM B. RICE and ROBERT H. MEEHAN

Designed to acquaint the student with management significance of reports and forms. Role of paperwork in general and reports and forms in particular in modern administration. Potential for management improvement and economy through better reports and forms. Emphasis on improving contribution of documents to systems and procedures they serve. How to install, operate, and appraise reports and/or forms management.

## 4-421. Writing Procedures and Instructions

Spring, 2 credits

FREDERIC C. OSGOOD

Designed to increase competence in instructional writing. Study and practice of principles and techniques applicable to writing of formal procedures and instructions, especially for codified manuals. Discussion of expository writing, format, style, and use of illustrations. Development of outline for, and preparation, review, and revision of actual instruction. *Prerequisite:* Management of Directives Systems, or experience at Grade GS-5 or above in the composition of written instructions.

## 4-330. Government Letter Writing

Fall, 2 credits. Repeated in Spring

LUCILE N. BOYD

Intended for the student in an administrative position required to handle administrative problems through correspondence. Writing clear, accurate, concise, courteous letters and memoranda. Principles of effective letter writing. Practice in criticizing and revising outgoing correspondence, and in planning and drafting replies to incoming letters. *Prerequisite:* Good foundation in English grammar, vocabulary, and composition through courses or writing experience.

### CERTIFIED PROFESSIONAL SECRETARY

For the student who plans to take the Certified Professional Secretary (CPS) examination, the following courses may be useful: Business Law, English for Secretaries—Rapid Review, Essentials of Good Office Management, Everyday Mathematics, General Psychology, Human Relations in Administration, Practical English Usage, Principles of Economics, and Modern Supervisory Practice.

## Shorthand

The courses in shorthand are designed to offer a program of training for a stenographic career in the Federal service. Each course represents a separate unit of study, in which emphasis is placed on materials similar to those used in the Federal Government. The sequence of courses presents a sound foundation to qualify for the various grades of stenographers in the Federal service.

The student must have a good command of English. Otherwise Practical English Usage or English for Secretaries should be taken before registering for a shorthand course.

Review of Gregg Shorthand (Anniversary) serves as a rapid review course for the student who has not used his shorthand recently, or who needs additional practice in office dictation. The student who wishes to review Simplified Gregg should enroll in Gregg Shorthand, 60–80 Words.

In order to reach the goals stated in the course descriptions, home study is essential. The amount of study varies with the learning ability and requirements of the individual student.

## 2-35. English for Secretaries (See P. 21)

## 4-89. Review of Gregg Shorthand (Anniversary), 60-80 Words

Fall, non-credit. Repeated in Spring and Summer

FRANCES A. BUTLER  
ELIZABETH T. CARROLL  
ILDA DOW

Review of theory and brief forms. Reading from shorthand plates and notes of student. Dictation of standard material at various progressive rates of speed. *Prerequisite*: Completion of the *Gregg Manual*, or its equivalent by Anniversary system. The shorthand writer who has completed Gregg simplified theory may also register in order to acquire shortened forms for higher speed dictation.

## 4-129. Gregg Shorthand I

Fall, 3 credits. Repeated in Spring and Summer

E. DONALD BELL  
KATHERINE K. BLAIR  
WILHELMINA M. CERINE  
VINCENT B. VALLIERES  
GERALD H. WICK

Theory of Gregg Shorthand Simplified. Beginning dictation on new and familiar material.

## 4-130. Gregg Shorthand II

Fall, 3 credits. Repeated in Spring and Summer

E. DONALD BELL  
WILHELMINA M. CERINE  
VINCENT B. VALLIERES

Increasing mastery of principles of Gregg Shorthand Simplified through review and drill. Minimum dictation speed of 60 words a minute attained, with accurate transcription on new standard material. *Prerequisite*: Gregg Shorthand I, or equivalent.

## 4-225. Gregg Shorthand III (60-80 Words)

Fall, 3 credits. Repeated in Spring and Summer

E. DONALD BELL  
WILHELMINA M. CERINE  
VINCENT B. VALLIERES

Review of theory. Brief forms, word beginnings and endings. Preliminary phrasing. Extensive dictation practice, using general business and governmental material. In-class and outside transcription. Sample Civil Service test material. Maximum dictation speed of 80 words a minute attained. *Prerequisite*: Gregg Shorthand I and II, or equivalent, and minimum speed of 60 words a minute on new standard material.

## 4-226. Gregg Shorthand IV (80-100 Words)

Fall, 3 credits. Repeated in Spring

MARCELLA E. TROTTON

For the shorthand writer of any system with dictation speed of 80 words a minute and ability to transcribe letters and reports accurately.

## 4-227. Gregg Shorthand V (100-120 Words)

Spring, 3 credits. Repeated in Summer

FRANCES A. BUTLER

For the shorthand writer of any system with dictation speed of 100 words a minute. Civil Service procedure tests and Gregg awards.

# Physical Sciences

DEPARTMENTAL COMMITTEE

Henry Stevens, *Chairman*

Bernard H. Armbrecht, William E. Benson, Albert V. Carlin, John Harms, Joseph Hilsenrath, John Lyman (*vice-chairman*), John G. Manning, Paul W. McDaniel, Alfred Weissler

Professional and cultural courses in this department afford unusual opportunity for study under guidance of practicing scientists. Unless specifically stated, there is no laboratory work.

## General

### 5-225. Principles of Physical Science

Year, 2 credits each semester

MICHAEL J. PALLANSCH

Survey course for those working with scientific materials but without scientific training. Especially for editors, information specialists, librarians, research assistants, and others with general interest in current developments in physical sciences. Relationships of concepts held in common in chemistry, cosmology, medicine, and physics to recent developments in antibiotics, atomic power, human nutrition, space travel, synthetic fibers, and other subjects of current interest. A student may register for the second semester without the first.

### 5-442. Development of Modern Science

Fall, 2 credits

NATHAN REINGOLD

Survey of growth of knowledge in biological and physical sciences. Principal emphasis on emergence of basic concepts, patterns of research, and scientific profession with specific institutions. Relation of these to development of applied research, changes in intellectual climate, and other consequences of scientific advance.

### 5-437. History of Science in United States

Spring, 2 credits

WYNDHAM D. MILES

Development of science in United States from colonial times to present. Trends in science education, science societies, and science publications. Development of science in government. Rise of industries based on science. Lives and contributions of significant American scientists.

### 5-175. Descriptive Astronomy

Year, 2 credits each semester

KYONG CHOL CHOU

Designed to give both layman and amateur astronomer better understanding of astronomy. Neighbors of solar system, such as moon, planets, comets, and meteors. Galaxy and associated interstellar phenomena. Basic principles of telescopes and spectroscopy. Nontechnical introduction of fundamental physical laws. *Prerequisite*: High school algebra. A student may register for the second semester without the first.

### 5-349. Advanced Space Science

Fall, 2 credits

ROBERT F. FELLOWS

Lectures and sample problems in space sciences. Application of rockets to study of earth and other planetary atmospheres and ionospheres, including origin, composition, structure, and dynamics.



Nature and characteristics of energetic particles in space including galactic cosmic radiation, trapped radiation (Van Allen type), solar flares, and particles. Theories explaining mechanisms accelerating particles. Origin, nature, and theory of magnetic fields and use of space probes and satellites in their measurement and characterization. Solar-terrestrial relationships. Biological systems and space environment. Search for extra-terrestrial life. Micrometeorites and cosmic dust. Radio astronomy from space vehicles. Description of space science research program of United States and other nations. (Course not concerned with technology of launching vehicles or manned-space flight.) *Prerequisites*: College level courses in calculus and physics, or equivalent.

## 5-441. Technology of Modern Food Processing

Spring, 2 credits

LOWRIE M. BEACHAM

Basic principles and techniques employed in various methods of food preservation. Older techniques of drying, pickling, canning, freezing, and newer advances in dehydrofreezing, freeze-drying, use of ionizing radiations, and the like. Historical review of fundamental research making modern food processing possible. Use of preservatives and other currently permitted food additives. Applicable provisions of Federal Food, Drug, and Cosmetic Act dealing with foregoing and other aspects of food manufacture and distribution. Identity, quality, grade standards, and objective methods of evaluating various factors used therein. *Prerequisite*: Course in general chemistry at undergraduate level. Additional courses in organic chemistry and bacteriology recommended, but not required.

## 5-765. Practical Electronics for Biologists and Chemists

Year, 2 credits each semester

KARL H. NORRIS

PAUL E. WILKINS

First semester: Nonmathematical physical explanation of basic principles of electricity. AC and DC circuits. Passive electronic components. Vacuum tubes and transistors. Chemical and biological transducers. Practical information on measurements, trouble shooting, design, and limitation of instrumentation. Demonstrations on construction and application of hardware items. Second semester: Specific electronic instrumentation. Problems in spectrophotometry, spectroscopy (visible, IR, electron, and neutron), recording instruments, vacuum technology, feedback control systems, nuclear magnetic resonance, and the like. *Prerequisite*: Bachelor's degree.

## Chemistry and Physics

### 5-100. General Chemistry

Year, 3 credits each semester

RICHARD H. JAQUITH

NOBEL WAKABAYASHI

Designed to provide background in problems and practices of chemistry for workers in other professional fields and for subprofessionals in chemical work. Descriptive chemistry of commoner elements and consideration, at appropriate level, of atomic theory, periodic table of elements, valence, acid-base concepts, oxidation-reduction reactions, reaction rates and equilibria, pH, normality and molarity, and stoichiometry. Consideration of mathematical problems related to chemistry. *Prerequisite*: High school algebra.

### 5-248. Organic Chemistry

Year, 3 credits each semester

BENJAMIN H. ALEXANDER

NOBEL WAKABAYASHI

Major emphasis on aliphatic and alicyclic chemistry. Also aromatic, heterocyclic, and carbohydrate chemistry. Consideration of complex alkaloids. Emphasis throughout on general principles. Use of electronic conceptions where pertinent. *Prerequisite*: General Chemistry, or equivalent.

### 5-703. Physical Chemistry

Year, 3 credits each semester

IRVIN LEVIN

Intermediate course in branch of chemistry dealing with physical properties of substances related to chemical properties and changes. Logical stepwise development of natural philosophy of chemistry from simple to more complex theoretical principles. Terminology, roles of energy and electron, and comparisons between idealities of man and actualities of nature. Lecture demonstrations where feasible as substitute for laboratory experiment. Discussion and/or display of instrumentation where pertinent. Mathematical problems as homework. *Prerequisite*: Bachelor's degree in a physical science.



## 5-424. Chemistry of Behavior

Year, 3 credits each semester

BYRON E. LEACH

Designed to give basic knowledge accumulated on chemistry of behavior in man and animals, including chemical reactions that control central nervous system. Special emphasis on biochemistry of mental diseases and compounds known to produce model psychoses. Survey of neuropharmacological agents with particular emphasis on tranquillizing drugs. Nature and distribution of compounds that influence behavior of certain insects, including sex attractants. *Prerequisite*: Basic knowledge of organic chemistry.

## 5-315. Elementary Biochemistry

Year, 2 credits each semester

DONALD F. FLICK

Comprehensive survey of chemistry of body constituents and metabolic conversion. First semester: Chemistry of carbohydrates, fats, proteins, and fundamentals of enzyme chemistry. Second semester: Digestion and absorption of food, intermediary metabolism, and the physiological role of vitamins and hormones. *Prerequisite*: Organic Chemistry.

## 5-320. Basic Biochemistry

Year, 2 credits each semester

LOUIS FEINSTEIN

First semester: Comprehensive survey of biochemistry at elementary level. Structure, function, and interrelationship of carbohydrates, fats, proteins, vitamins, minerals, hormones, and enzymes. Second semester: Modern experimental approaches to metabolism at cellular level and in whole organism. General and specific topics in plant biochemistry and animal biochemistry. *Prerequisite*: Elementary organic chemistry.

## 5-403. Biochemistry of Steroid Hormones

Fall, 3 credits

WILEY W. TOLSON

Biological actions of androgens, estrogens, progesterone, adrenocorticoids, and related steroids. Analytical procedures for determination of certain steroid hormones in biological specimens. Structures and nomenclature of these compounds. *Prerequisite*: Organic Chemistry, or equivalent.

## 5-408. Nuclear Magnetic Resonance Spectroscopy

Fall, 3 credits

ERNEST LUSTIG

Physical foundations of nuclear magnetic resonance (n.m.r.). Analysis and interpretation of n.m.r. spectra, with emphasis on applications to structural chemistry. *Prerequisites*: College chemistry and physics.

## 5-155. Principles of Physics

Year, 2 credits each semester

ALBERT E. SMITH

Descriptive course designed to acquaint the student with fundamental phenomena and laws of mechanics, light, heat, electricity, magnetism, and modern physics. Designed for the nonscience student who wishes an introduction to physics. *Prerequisite*: High school algebra. A student may register for the second semester without the first.

## 5-126. Modern Physics

Fall, 2 credits

GORDON K. DICKER

Descriptive treatment of atomic and nuclear structures, nuclear fission and fission reactors, fusion, and nuclear radiations and their reactions. Introduction to special relativity and quantum principles. *Prerequisites*: College mathematics through calculus and some college physics, or special permission.

### 5-411. Biophysics

Fall, 3 credits

ALFRED WEISSLER

Descriptive survey of applications of physical and chemical principles to biological systems. Molecular basis of vision. Structure of viruses. Nerve conduction. Photosynthesis. Molecular and cellular effects of ionizing radiation. Thermodynamics of enzyme reactions. Ultrasonic effects. Molecular genetics. *Prerequisites*: College biology, chemistry, and physics.

### 5-413. Biophysical Instrumentation

Fall, 2 credits

WILLIAM J. CAMPBELL

Survey course designed to present techniques of physical measurement and control. Descriptive rather than analytical approach covering methods of measurement and control in use in industrial and physical laboratories. Expedient trail methods and improvisations applicable to research problems. *Prerequisite*: College physics, or equivalent.

### 5-431. Principles of Fusion Power

Fall, 3 credits

H. HARRISON

Basic physics principles and engineering techniques for controlled fusion power experiments. Major topics: Kinetic theory of gases. Electromagnetic wave theory. Motion of charged particles in electric and magnetic fields. Magneto hydrodynamics. Plasma stability. Glow and arc discharges. Experimental devices for heating and confining plasma and measurement techniques.

### 5-418. Introduction to Gas Chromatography

Fall, 2 or 3 credits

IRWIN HORNSTEIN  
LEO KAZYAK

Elementary course in fundamentals and techniques of chromatography. Detectors and detector sensitivity, effects of temperature, gas flow, and gas pressure and column preparation. Simple applications of gas chromatography to analysis of gases and volatile compounds. *Prerequisite*: General Chemistry, or equivalent.

### 5-419. Applications of Gas Chromatography—Seminar

Spring, 3 credits

LEO KAZYAK

Designed to acquaint the student with current developments in gas chromatographic applications. *Prerequisite*: Introduction to Gas Chromatography, or equivalent.

## Geography and Geology

Courses in Meteorology, Oceanography, Soil Science, and Surveying and Mapping are closely related to this field.

### 2-114. Maps and Charts

(See P. 27)

### 5-203. General Geology

Fall, 3 credits

RAYMOND C. DOUGLASS

Minerals and rocks as constituents of earth's crust. Processes of weathering, erosion, and deposition. Vulcanism. Structures of sedimentary and igneous rock formations. Diastrophism. Mountain building. Land forms and their relation to various geologic processes. Stability of earth's crust. Classroom exercises in study of common minerals and rocks and interpretation of topographic and geologic maps. *Prerequisite*: Inorganic chemistry desirable.

## 5-204. Historical Geology

Spring, 3 credits

RAYMOND C. DOUGLASS

Study of development of earth through time, growth and destruction of mountains, origin of sedimentary formations, and development of plants and animals from first meager evidences of life to present. Field and laboratory study of rocks and fossils of representative geologic ages exposed in greater Washington area. *Prerequisite*: General Geology, or acquaintance with principles and processes of physical geology.

## 8-208. Aerial Photographic Interpretation (See P. 96)

## 8-408. Advanced Aerial Photographic Interpretation (See P. 96)

## [5-533.] Hydrology (1965-66 and alternate years)

Year, 3 credits each semester

TOR NORDENSON

Basic and applied hydrology at professional level. First semester: Elementary hydraulics. Measurement and interpretation of streamflow, precipitation, and other basic data. Hydrologic cycle. Physics of soil moisture. Infiltration theory. Wave travel and unit hydrograph. Second semester: Development and application of procedures for applying basic hydrology to practical problems of river forecasting and design of water control works, including streamflow routing, flood frequency, rational method of estimating flood magnitude, hydrometeorology, forecasting of runoff, influence of water control structures on streamflow, and problems of water control operation. *Prerequisites*: College algebra and physics. Elementary meteorology, statistics, and engineering desirable.

## Soil Science

## 5-405. Soils: Their Nature and Geography (1964-65 and alternate years)

Spring, 3 credits

ROY W. SIMONSON

Nature and distribution of soils, especially in relation to other elements of natural environment. Discussion of nature and properties of soils with minimum of technical terms. Factors and processes of soil formation. Distribution of soils in broad regional patterns, with emphasis on United States. Consideration of reasons behind patterns. Local patterns of soil distribution and explanations for them, with examples from different regions. Significance of patterns of distribution to present uses and to potentialities of soils for various uses. *Prerequisite*: College Freshman chemistry, or equivalent. Previous training in physical geography, geology, or plant ecology desirable.

## [5-531.] Soils: Their Morphology, Genesis, and Classification (1965-66 and alternate years)

Spring, 3 credits

ROY W. SIMONSON

Morphological characteristics of soils, mode of formation, and classification. Review of prevailing concepts of soils. Discussions on soil profile and its horizons, with illustrations from great soil groups of world. Consideration of steps and processes of soil formation in relation to morphology and composition of soils. Logic of classification and its application to soils, together with systems of soil classification. Frequent examples to indicate importance of understanding nature and origin of soils to effective utilization of soil resources. *Prerequisites*: College Freshman chemistry, or equivalent, and introductory soil science. Background in geology and some advanced chemistry desirable.

## Meteorology

The following courses in meteorology are offered in cooperation with the United States Weather Bureau. They may be taken individually, or as a program leading to a certified statement of accomplishment. Registration is open to all qualified students.

## CERTIFIED STATEMENTS OF ACCOMPLISHMENT IN METEOROLOGY

A Certified Statement of Accomplishment in Meteorology is granted to a student who has completed an organized program either on the elementary or on the advanced level.

## ELEMENTARY CERTIFIED STATEMENT

## Requirements

1. Required prerequisite courses:

Calculus  
College physics

Courses in differential equations and vector analysis are recommended for the student who plans to make meteorology his professional career. Courses in chemistry and statistics are also useful but not essential.

2. 19 semester hours of credit with a grade of C or better in each of the following courses:

General Meteorology (3)  
Introduction to Dynamic Meteorology (6)  
Synoptic Meteorology (6)  
Weather Analysis and Forecasting (4)

## ADVANCED CERTIFIED STATEMENT

## Requirements

1. 34 semester hours of credit including all courses required for the Elementary Statement
2. Advanced Weather Analysis and Forecasting (6)
3. Electives (9 credits)
  - Agricultural Meteorology (3)
  - Applied Climatology (3)
  - General Oceanography (2)
  - Physics of Upper Atmosphere (2)
  - Principles of Statistical Analysis (6)
  - Satellite Meteorology (3)
  - Structure of Ionosphere (2)
  - Tropical Meteorology (3)

*A student seeking either of these certified statements should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. Equivalent courses will be accepted by transfer from other institutions. An applicant for either certified statement must file a transcript of his high school or college record before completion of his program.*

## 5-326. General Meteorology

Spring, 3 credits

HUGO V. GOODYEAR

Fundamentals of physical aspects of modern meteorology for the professionally interested student. Atmospheric composition and structure and their measurements. Solar and terrestrial radiation and radiation laws. Gas laws. Adiabatic, pseudoadiabatic, and non-adiabatic processes. Fronts. Thunderstorms. Fog. Wind. *Prerequisites:* Two years of high school algebra and trigonometry.



## 5-330. Agricultural Meteorology

Fall, 3 credits

TERRELL L. NOFFSINGER

Application of meteorology and climatology to operational problems in agriculture. Micro-meteorology applied to agriculture. Heat and water budgets in plant zone of soil and atmosphere, elementary soil physics, and meteorology of enclosed spaces. Agricultural climatology and micro-climatology. Effects of weather on agricultural production, including economic and physical effects on plants, animals, insects, and plant diseases. Weather services for agriculture, including specialized synoptic forecasts, utilization of climatological data, and instrumentation for agricultural observations. *Prerequisite*: Introductory meteorology, or special permission.

## 5-415. Applied Climatology

Fall, 3 credits

HERBERT C. S. THOM

Discussion of statistical tools of climatological analysis needed for solution of applied problems. Solution of examples from agriculture, aviation, engineering, and specialized aspects of industry. The student works these problems as exercises.

## 5-534. Introduction to Dynamic Meteorology

Year, 3 credits each semester

GERALD A. PETERSEN

Application of general principles of mechanics, thermodynamics, and fluid motions to study of the atmosphere and its movements. *Prerequisites*: College physics and mathematics through differential and integral calculus, or equivalent.

## [5-536.] Synoptic Meteorology (1965-66 and alternate years)

Year, 3 credits each semester

E. PAUL McCLAIN

Description and explanation of circulation and weather processes observed in atmosphere, with emphasis on forecasting applications. First semester: Air motion, three-dimensional structure of pressure and wind systems, cyclones, anticyclones, front, air masses, and prognosis of circulation pattern. Second semester: Temperature forecasting, clouds and precipitation, fog and other visibility phenomena, thunderstorms, squall lines, tornadoes, turbulence, icing, sea breeze, and mountain and valley winds. *Prerequisites*: General Meteorology, college physics, and calculus, or special permission.

## 5-538. Weather Analysis and Forecasting (1964-65 and alternate years)

Year, 2 credits each semester

JAY S. WINSTON and CARLOS R. DUNN

Laboratory course in applying concepts of air masses, fronts, and midtropospheric flow patterns to analysis and prognosis of sea level and upper air weather charts for North America and adjacent areas. Preparation of short range forecasts of various weather elements for local and regional areas of United States, utilizing guidance material from National Meteorological Center. Special emphasis on proper use of numerical circulation prognoses. *Prerequisite*: Synoptic Meteorology, or equivalent. This course may be taken concurrently with Synoptic Meteorology.

## [5-580.] Advanced Weather Analysis and Forecasting (1965-66 and alternate years)

Year, 3 credits each semester

CARLOS R. DUNN and JAY S. WINSTON

Treatment of many techniques and concepts important in present-day forecasting, including some more advanced developments. First semester: Hemispheric synoptic map analysis. Predicting motion and development of waves in westerlies. Numerical weather prediction. Large-scale vertical motion and divergence. Isentropic analysis. Jet stream. Second semester: Extended-range forecasting. Statistical prediction methods. Forecasting tornadoes and severe thunderstorms. Lectures and laboratory. *Prerequisites*: Dynamic Meteorology, Synoptic Meteorology, and Weather Analysis and Forecasting, or equivalent.

## 5-589. Tropical Meteorology

Fall, 3 credits

LESTER F. HUBERT

Lecture and laboratory course designed to present principles of tropical meteorology to the student with fairly good background in general meteorology. Discussion of synoptic and dynamic meteorology from point of view of examining modifications to theoretical and synoptic applications required by low latitude meteorology. Main emphasis on lectures. Convection. Dynamics and kinematics of tropics. Synoptic models. Hurricane structure. Methods of hurricane forecasting. Minor laboratory work introducing the student to analysis methods for low latitudes. Emphasis on isogon-isotach (streamline) analysis. *Prerequisites:* 20 hours of meteorology including introductory course in dynamics or hydrodynamics, or equivalent in experience. Calculus desirable.

## 5-595. Satellite Meteorology

Fall, 3 credits

SIGMUND FRITZ, LESTER F. HUBERT, JAY S. WINSTON and ASSOCIATES

Literal expansion of horizons of meteorology by meteorological satellites through producing on global scale comprehensive pictures of cloud systems, measurements of heat budget of earth, and other important meteorological observations. Designed to acquaint meteorologists with types of data obtainable from satellites. Methods of processing data for convenient meteorological use. Interpretation and use of picture and radiation data for synoptic research and forecasting. Physical interpretation of radiation data. Application of radiation data to studies of planetary heat budget and general circulation. Advanced instrumentation and new experiments on future satellites. National and international aspects of operational meteorological satellite program. Lecture course, with some illustrative laboratory work for each student. Solution of typical space-geometry problems involved in television picture rectification and infrared sensor data location. Interpretation of pictures in terms of meteorological parameters. Analysis of infrared radiation data and its use in determining cloud-top height and surface temperature. *Prerequisites:* Dynamic and synoptic meteorology, calculus, and college physics, or special permission.

## 5-592. Physics of Upper Atmosphere and Sounding Techniques

Fall, 2 credits

JAMES GIRAYTYS and SIDNEY TEWELES

Designed to familiarize the student with thermal, chemical, and electrical properties of atmosphere from 30 to 200 kilometers. Statistical theory of temperature. Problems of measurement in rarefied gas. Sensor design and employment. Atmospheric sounding rockets and data acquisition. Results of recent experiments. General theory of ionosphere and solar influences on atmosphere. Various physical models of atmosphere and their diurnal and seasonal variations. Advanced atmospheric programs being conducted by government agencies. *Prerequisites:* College physics and calculus. General Meteorology desirable.

## 5-593. Structure of Ionosphere

Spring, 2 credits

JAMES GIRAYTYS and SIDNEY TEWELES

Introduction to electrified region of atmosphere termed ionosphere. Properties, constitution, steady state, and significant variations of ionosphere. Radio propagation through ionosphere. Ionospheric measuring techniques. Examination of Aurora and Airflow as sources of information about upper atmosphere. Selected readings in current literature assigned for student presentation. *Prerequisites:* College physics and calculus, and Physics of Upper Atmosphere and Sounding Techniques, or special permission.

## Oceanography

The following courses in oceanography are offered in cooperation with the United States Naval Oceanographic Office. They may be taken individually, or as a program leading to a certified statement of accomplishment. Registration is open to all qualified students.

## CERTIFIED STATEMENT OF ACCOMPLISHMENT IN OCEANOGRAPHY

A Certified Statement of Accomplishment in Oceanography is granted to a student who has completed an organized program of courses in the field.

## Requirements

1. 20 semester hours of credit with a grade of C or better in each of the following courses:
  - a. Required courses (6 credits)
    - Physical Properties of Sea Water (2)
    - Geological Oceanography (2)
    - Biological Oceanography (2)
  - b. Electives (8 credits)
    - Principles of Underwater Sound (2)
    - Applied Underwater Sound (2)
    - Practical Electronics for Oceanographers (2)
    - Ocean Surface Waves (2)
    - Marine Meteorology (2)
    - Dynamic Oceanography (2)
  - c. 6 semester hours of credit in fields related to oceanography, including biology, chemistry, engineering, geography, geology, mathematics, and meteorology.

*A student seeking this certified statement should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. Equivalent courses will be accepted by transfer from other institutions. An applicant for this certified statement must file a transcript of his high school or college record before completion of his program.*

## 5-360. General Oceanography

Fall, 2 credits

ROBERT E. BURNS  
STEACY D. HICKS

Characteristics of oceans and factors that control distribution of properties and of plants and animals. Biology, chemistry, geology and physics of the oceans. *Prerequisite*: College courses in at least two of the physical or biological sciences.

## 5-475. Principles of Underwater Sound

Fall, 2 credits

MORRIS SCHULKIN

Fundamental principles of acoustics and application of these principles to underwater sound. Transmission of sound in the sea, including refraction, reflection, scattering, attenuation, and fluctuation. *Prerequisites*: Calculus and college physics.

## 5-476. Applied Underwater Sound

Spring, 2 credits

MORRIS SCHULKIN

Applied theory and practice for those entering the field or working in related fields. Ray theory, normal mode theory, sound channels, noise and reverberation, measurement techniques, and elements of transducer design. *Prerequisite*: Principles of Underwater Sound, or equivalent.

## 5-584. Physical Properties of Sea Water (1964-65 and alternate years)

Spring, 2 credits

ROBERT E. BURNS

Examination of physical principles governing properties of sea water. Comparison of these properties with those of pure water. Definition and calculation of salinity and density. Distribution of salinity, temperature, and density.



[5-585.] Practical Electronics for Oceanographers (1965-66  
and alternate years)

Spring, 2 credits

S. O. BAILEY

Basic principles of electronic theory and elementary circuitry. Demonstration of composition of various instrument components, with emphasis on methods of combining components for specific instrumentation. Practical demonstrations and laboratory work.

5-655. Ocean Surface Waves (1964-65 and alternate years)

Spring, 2 credits

J. J. SCHULE, JR.

Measurable properties of ocean surface waves and the methods of observing and analyzing ocean waves. Demonstration of wave solution to hydrodynamic equations. Discussion of various sea surface models including their assumptions, solutions, and practical applications. Problems of propagation of waves in dispersive medium. Examples of various forecasting techniques. *Prerequisite:* Calculus, or Mathematics for Oceanographers.

5-658. Geological Oceanography (1964-65 and alternate  
years)

Fall, 2 credits

JOSHUA I. TRACY, JR.  
MARTIN WEISS

Topography, composition, processes of sedimentation, and geologic history of ocean basins, continental shelves, and coastal features. *Prerequisite:* Professional knowledge of geology or oceanography.

[5-662.] Marine Meteorology (1965-66 and alternate years)

Fall, 2 credits

M. D. BURKHART

Introduction to fundamental principles of marine meteorology with special emphasis upon problems of marine climatologist and physical oceanographer. Descriptive and synoptic meteorology. Air mass analysis. Boundary processes. Radiation. Climatic principles. *Prerequisite:* Professional knowledge of meteorology or oceanography.

[5-664.] Dynamic Oceanography (1965-66 and alternate  
years)

Fall, 2 credits

J. J. SCHULE, JR.

Introduction to principles of vector analysis. Development of principles of conservation of mass and momentum. Vector equations of motion. Hydrostatic equations and density-pressure-depth relationship. Various current equations. Principles of turbulence. Equation of mean motion. Various approaches to problem of evaluating eddy stress terms. *Prerequisite:* Physical Properties of Sea Water or equivalent.

5-666. Biological Oceanography (1964-65 and alternate  
years)

Fall, 2 credits

SAMUEL A. ARNY

Detailed examination of marine ecosystem, stressing community relationships and influence of the physicochemical environment on marine life. Distribution of flora and fauna.



# Public Administration

## DEPARTMENTAL COMMITTEE

John H. Thurston, *Chairman*

Gladys L. Baker, Tony M. Baldauf, K. A. Butler, John C. Cooper, Jr., Erwin R. Draheim, Thomas J. Flavin, Warner H. Hord, Clare Hendee, Henry G. Herrell, G. E. Hilbert, Dorothy H. Jacobson, Martin Kriesberg, William A. Minor, Ross Pollock, Max P. Reid, John L. Wells (*Vice-chairman*)

Public administration deals with the processes of operating government. As the Federal Government has become larger and more complicated, it has become more important to study and understand these processes in order to achieve effective administration of public programs. The processes of administration include general administration and management, personnel administration, budgeting, accounting and other aspects of financial administration, procurement and property management, and legal administration.

The Department of Public Administration offers courses in all these areas as well as in American national government and American history.

## CERTIFIED STATEMENTS OF ACCOMPLISHMENT IN PUBLIC ADMINISTRATION

### COMMITTEE

Gladys L. Baker, *Chairman*

Warner H. Hord, Martin Kriesberg, John H. Thurston

Certified Statements of Accomplishment in Public Administration are granted to the undergraduate and advanced student who complete organized courses of study in public administration intended to provide basic training for responsible administrative work.

### *Undergraduate Certified Statement of Accomplishment*

The program leading to the Undergraduate Certified Statement of Accomplishment in Public Administration should be of special interest to the administrative assistant who wishes to prepare for a more responsible administrative position. The opportunity to take advanced and specialized courses should be equally attractive to the Management Intern who enters the Federal Service with a management option. The students who enter with other professional options can also profit greatly from these courses if they wish to prepare to enter upon administrative work connected with their professional fields. This program is useful for the student in a non-administrative specialty who expects to take on administrative duties, or who wishes to enter administrative work. The student in a technical field can also find opportunity from this program to broaden his understanding of Government administration. Graduation from high school, or the equivalent, is the minimal educational background required.

Requirements (40 credits)

1. 20 semester hours of credit with a grade of C or better in college level courses in the Social Sciences.

## Required courses:

American or European Government, or Political Science  
 Principles of Economics  
 American or European History  
 Introduction to Public Administration

These requirements may not be waived, but equivalent courses may be accepted by transfer from other institutions. With the approval of the Registrar, credit may also be given for 6 semester hours of tool courses relating to work in public administration. These may be in accounting, economics, statistics, writing, or a subject-matter area concerned with the work of the department or agency in which the student is employed.

2. 20 semester hours of credit with a grade of C or better in courses in public administration, excluding all accounting courses except Internal Auditing. These are to be distributed, as follows:
  - a. 6 credits from Management Analysis
  - b. 14 credits from General Administration, Budgetary and Financial Administration, Legal Administration, Personnel Administration, Procurement and Property, or additional courses in Management. The student is advised to include in his program at least one course from each area.
  - c. Credit may be given for courses other than those in public administration with the approval of the Registrar. These courses should be compatible with the major interest of the student. Not more than two courses may be from Office Techniques and Operations.

*A student seeking this certified statement should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. When the student has completed the requirements in the social sciences and 15 semester hours in public administration, he should review his course of study with the Registrar. Equivalent courses will be accepted by transfer from other institutions.*

### *Advanced Certified Statement of Accomplishment*

The program leading to the Advanced Certified Statement of Accomplishment in Public Administration offers an organized course of study intended to provide advanced training in management. The program should be of interest to the student who is responsible for management of operating programs as well as to those in specialized fields of management who wish to add perspective to their work. The program is also designed for the student who wishes to prepare for a more responsible administrative position and for those in scientific, technical and professional work who have or expect to have administrative responsibilities. The requirements are designed to assure broad coverage in the major areas of administration.

## Requirements (20 credits)

1. An undergraduate degree, an Undergraduate Certified Statement of Accomplishment in Public Administration, or Government experience at the GS-9 level, or above.
2. 20 semester hours of credit with a grade of B or better, as follows:
  - a. 15 credits from the following:
    - Budgetary and Financial Administration (2)
    - Comparative Administration (3)
    - Dynamics of Organization (2)

Employment and Placement (3)  
 Employee Training and Development (3)  
 Executive Staffwork (3)  
 Human Relations in Administration (3)  
 Legislative Process (2)  
 Management—Seminar (3)  
 Modern Supervisory Practice (2)  
 Principles and Practices of Management (2)  
 Readings in Public Administration (3)  
 Techniques of Organization (3)

- b. Remaining credits selected from courses numbered 500 or above in public administration or, with the approval of the Registrar, in other social sciences.

*A student seeking this certified statement should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. When the student has completed 12 credits in public administration, he should advise the Registrar so that he may be assigned to an advisor. Equivalent courses will be accepted by transfer from other institutions. An applicant for either certified statement must file a transcript of his high school or college record before completion of his program.*

*The student who has completed the requirements for the Undergraduate or Advanced Certified Statement of Accomplishment in Public Administration with an average grade of B or better may qualify for honors by passing an oral examination. The examination is given by a panel set up by the Graduate School. The student who wishes to take an oral examination should apply to the Registrar at the completion of his program.*

## General Administration

### COMMITTEE

Martin Kriesberg, *Chairman*

Gladys L. Baker, Jack Koteen, A. J. Nichols, Seymour Wolfbein

These courses offer general understanding of American Government and administrative processes and provide a foundation for more specialized work in management and public administration. A student who plans to take courses in any of the specialized fields of administration will find that his work will be more meaningful and useful if he has first completed some of the background and basic courses listed here.

### 6-341. American National Government

Fall, 3 credits. Repeated in Spring

SALVATORE NERBOSO

History and origins of national Government of the United States. Political process: Parties and elections. Legislative process. Functions of national Government and their administration. Courts and judicial review of legislation.

### 6-344. Introduction to Public Administration

Fall, 2 credits

HIRAM S. PHILLIPS

Designed to introduce the student to elements of public administration and to lay the foundation for further study and practice in this field. Nature and scope. Management of public affairs. Contrasts and similarities in public and private management. Mechanisms and procedures for carrying out public function. Relationships of branches of government in United States.



## 6-348. Public Policy and Economic Development

Fall, 2 credits

CLARENCE J. HEIN and MARTIN KRIESBERG

Process of policy formation, particularly in economic area. Issues and interests involved in such critical areas as: Role of government as stimulator and regulator of nation's economy. Foreign trade and aid. Programs to combat poverty and to avoid technological maladjustments, and others. *Prerequisite*: Introduction to Public Administration, or Principles of Economics, or special permission.

## 6-349. Current Policy Problems and Administration

Spring, 2 credits

CLARENCE J. HEIN

Examines administrative process and problems in carrying out current domestic and foreign policy. Focuses upon both administrative and substantive content of alternative policies and their interrelationships. Selection of several policy problems each semester from current economic, social, and foreign problems, such as poverty or desegregation, metropolitan area problems, and European Economic Community or DeGaulle and French policy.

## 6-515. Legislative Process

Fall, 2 credits

CARL R. SAPP

Legislative process in Federal Government. Emphasis on substantive aspects of executive-legislative relationships. Organization of Congress. Consideration of bills in committee and on floor. Legislative functions of the President. Assistance by executive agencies in legislative process. Informal relationships between legislative and executive branches. Congressional investigations of executive agencies. Legislative controls over administration. Influence of party leadership and special interest groups. Legislative aids. Proposals to improve legislative process. Informal discussion, visual aids, and lectures by recognized specialists. *Prerequisite*: American National Government, or equivalent.

4-201. Modern Supervisory Practice (See P. 46)

6-202. Management—Seminar (See P. 67)

6-347. Principles and Practices of Management (See P. 66)

## 6-400. Administrative Operations for Congressional Assistants

Spring, 2 credits

JEROME N. ELLER

Practical administrative problems encountered by secretaries and other staff assistants to United States Senators and Congressmen. Organization of office routine. Preparation and distribution of newsletters and publicity releases. Special services available to members of Congress. Use of Senate and House Documents and reports. Relations with the Executive departments. Pressure groups. Relations with constituents. Practical workings of Congress. Assistance with legislative matters.

## 6-453. Human Relations in Administration

Fall, 3 credits

JAMES M. ENNEIS  
ARTHUR R. LANEY, JR.

Designed to develop understanding of and insight into inter-personal relationships in large-scale organizations. Value orientations in administration. Formal and informal organization. Pathologies in administration. Status and role. Power and authority. Styles of leadership. Authoritarian and democratic administrators. Career dynamics. Psychological stress in administration. Motivation and morale.



## 6-454. Applied Human Relations in Administration

Spring, 3 credits

JAMES M. ENNEIS

Practice in applying principles of human relations in administration. Diagnoses of social processes in administration. Skills of effective performance in face-to-face situations. Formulation and assignment of administrative objectives. Creation of appropriate social climate. Leadership skills. Utilization of member resources. Irrational factors in administration. Decision-making processes. *Prerequisite*: Human Relations in Administration, or special permission.

## 6-459. Executive Staffwork

Fall, 3 credits

ALVIN J. HURT

To help staff personnel formulate philosophy and systematic approach for solution of broad management problems. For staff specialists and chiefs of staff offices. Appropriate for all staff specialists: Budget and accounting, management services, personnel planning, supply, and others. Staff role in modern management. Improving staff-line collaboration. "Executive staff method" in consultative approaches and innovation. Practice and critique in preparing and making presentations on selected management problem work situation of student.

## 6-735. Comparative Administration in Its Political and Social Environment

Spring, 3 credits

ALFRED J. DAVIDSON and JACK KOTEEN

Introduction to political and social environment of administration in emerging countries. Designed to increase understanding and awareness of difficulties that hinder or preclude transfer of modernizing administrative technology to emerging nations. Topics included: Sources and use of political power. Functions of political development. Power "elites," their viewpoints and values. Social and cultural barriers to change. Characteristics of traditional societies in transition and their impact on administrative institutions. Exploration of the bureaucratic tendencies of emerging nations. Efforts to improve personnel and merit systems. Movements of decentralization and rural development. Managerial and supervisory systems and practices. Training of foreign participants. Participation in small group country case study required. Guest speakers. Seminar methods.

## 6-600. Readings in Public Administration

Fall, 3 credits. Repeated in Spring

JOHN H. THURSTON, Coordinator

Supervised readings with monthly conferences on specified topics of administration or individual research and a paper on some problem or phase of administration, under the guidance of a senior administrative official. Readings or problem to be investigated determined in consultation with adviser. *Prerequisite*: Completion of all other requirements for Undergraduate or Graduate Certified Statement of Accomplishment in Public Administration, or by special permission with equivalent background in public administration.

## American History

### 6-250. American History to 1865

Fall, 3 credits

WAYNE D. RASMUSSEN

Political, social, economic, and cultural forces prior to 1865, contributing to development of American civilization. Summary of colonial period. Political, economic, and diplomatic factors of American Revolution. Development of national life and institutions.

### 6-251. American History since 1865

Spring, 3 credits

WAYNE D. RASMUSSEN

Political, social, economic, and cultural forces since 1865, contributing to development of present-day American civilization. Frontier movement and immigration. Constitutional growth and changes in world relations. Economic change and development.

## Management

### COMMITTEE

John C. Cooper, Jr., *Chairman*

N. Robert Bear, Edmund D. Dwyer, Arthur B. Jebens, Mark M. Kirkham, Gordon D. Osborn, Harold A. Stone, James H. Stover

Management analysts in Federal agencies serve as staff assistants to management officials for the purpose of improving the efficiency and effectiveness of the organization served. The paramount characteristic is ability to solve a wide variety of management problems through analytical ability of a high order and extensive practical and theoretical knowledge of management functions and techniques. Understanding of the management process is essential, as well as skill in the techniques used to gather and analyze data and develop appropriate policies, procedures, and control systems applicable in handling operating problems.

The courses outlined below offer basic training in the general field and in special areas.

### 6-347. Principles and Practice of Management

Fall, 2 credits

EDWARD F. WILSON

Knowledge and managerial responsibilities that distinguish professional managers from other professional personnel, in terms of both theory and application. Principles of planning, organizing, directing and controlling, and their application as encountered in public administration. Development and discussion of ways by which these management principles can be used by class participants in executing their supervisory responsibilities. *Prerequisite*: Supervisory work experience at Grade GS-9 or above, or special permission.

### 6-406. Principles of Management

Fall, 3 credits. Repeated in Spring

WALDEN COGGESHALL  
WILLIAM F. RAPP

Basic course covering nature of modern management and principles and best practices involved in management process. Subject matter studied in terms of basic functions in management: Planning, organizing, directing, coordinating, and controlling. Use of case materials. This course is offered when there is demand from individual students or a Federal department or agency on a contract basis.

### 6-405. Principles and Techniques of Management Analysis

Fall, 2 credits

JAMES W. GREENWOOD

General survey course for beginning management analyst. Principles and techniques of organization and management of Federal agencies. Emphasis on role of management analyst in assisting responsible officials to plan organization structure, conduct management surveys, improve paperwork management and data processing, and simplify work methods. Discussion of relationship of this function to other agency activities. Designed to acquaint the student with basic knowledge in field of management analysis. *Prerequisite*: Introductory course in public administration, or Principles of Management, or equivalent.

### 6-407. Staff Function of Management Analysis

Spring, 2 credits

RICHARD F. COOK

Study of management problems and their solution through staff units engaged in management analysis. Trends in modern management, stimulation of improvements in agency operation, relation of delegation of authority to organization, headquarters and field relationships, and role of staff units

in establishment of management controls and evaluation of results. From perspective of top management, the student undertakes comprehensive study of elements of management analysis essential to an effective staff function. *Prerequisite*: Principles and Techniques of Management Analysis, or special permission.

## 6-409. Conduct of Management Surveys

Spring, 2 credits

WILLIAM S. DINSMORE

Methods useful in management surveys, with emphasis on techniques required in fact-finding, logic necessary in analysis, and "selling" required in presentation of recommended solutions for identified problems. Study of comprehensive management survey including, but not limited to, reconnaissance, organization, functional, procedural, and special purpose surveys, survey workshops, and case studies. Designed to give journeyman analyst opportunity for advancement in field of management analysis. *Prerequisite*: Experience in management surveys, or special permission.

## 6-202. Management—Seminar

Fall, 3 credits. Repeated in Spring

WILLIAM R. VAN DERSAL

Designed for supervisors managing an organization or organizational segment involving subordinate supervisors. Review of basic elements of management. Study of management systems useful in organizations, including systems of career development, training, communications, supervisory development, and administrative control. Reviews of management literature and professional journals.

## 6-519. Work Standards and Work Measurement

Fall, 2 credits. Repeated in Spring

SIDNEY SCHNEIDER

Advanced techniques of scientific management concerned with development of work standards and measurement of work loads and performance, and of their adaptability in public administration. Statistical and experimental methods of determining standards. Dangers to avoid in setting standards. Time study. Standards as dynamic part of operations and tool in developing policies on personnel placement and training. Standards as aids in developing budgets, in planning operations, and in individual work planning. Relationship of standards of performance to those of costs and quality. Importance of dependable standards, measurement, and appraisal of performance to summary statements of progress for the use of higher administrative officials. *Prerequisite*: Practical working experience at Grade GS-7 or above, or special permission.

## 6-550. Techniques of Organization

Spring, 3 credits

EARL P. SHOUB

Organization of public and private agencies. Historical review as background for study of organization in modern society. Structural-functional approach of scientific management. More modern approach of behaviorists. Formal versus informal organization relationships. Staff and line responsibilities and authority. Group participation. Decentralized versus centralized organizations and their operation. Administrative leadership and reorganization. Charts and manuals.

## 6-740. Dynamics of Organization—Seminar

Fall, 2 credits

JOHN H. FINLATOR

Theory and practice of organization. Designed to assist managers and top supervisors in assessing why their organizations are never constant. Exploration of ever changing dynamics of modern organization. Growth of organization theory. Complexity of organization. Behavioral influence of man-groups and institutions on organization. Organization of future. Case histories on organization structure, conflicts in organization, and motivation. *Prerequisites*: Practical working experience in organization of management responsibilities at Grade GS-12, or above, or bachelor's degree in public administration, or one of following courses—Human Relations in Administration, Applied Human Relations in Administration, Techniques of Organization, or special permission.



## 6-415. Statistical Applications to Management Problems

Fall, 3 credits

BENJAMIN J. MANDEL

Practical course designed for management analysts, cost and budget officers, supervisors, and auditors. Deals with some of simpler statistical methods used in such management problems as forecasting, auditing, production control, and quality control. Case studies. Illustration of solutions to specific problems. Methods of quantifying problems and collecting data. Use of simple ratios. Law of statistical regularity. Regression techniques in making forecasts. Use of frequency distributions, conventional, and regression-type control charts in production and quality control.

3-523. Introduction to Linear Programming (See P. 38)

3-533. Introduction to Operations Research I (See P. 38)

## Budgetary and Financial Administration

### COMMITTEE

John L. Wells, *Chairman*

Charles L. Grant, Frank H. Spencer, Carl W. Tiller

These courses offer opportunities for the advanced student who has an interest in the basic substance and public policy aspects of financial and budgetary administration. These courses should be especially helpful to management-supervisory personnel having responsibilities in this area of administration. Those with limited experience in the field, or who are engaged in the procedural phases of budget formulation and execution, should begin their study with courses in Federal Budgetary Procedure and Federal Fiscal Procedure in the Department of Office Techniques and Operations.

### ADVANCED CERTIFIED STATEMENT OF ACCOMPLISHMENT IN FINANCIAL MANAGEMENT

The program leading to the Advanced Certified Statement of Accomplishment in Financial Management offers an organized program of study for the advanced student designed to provide an understanding of the basic substance and public policy aspects of financial management. The program should be of interest to government personnel well advanced in the fields of accounting and budgeting and to program administrators who need a better understanding of the policy aspects of financial management.

### Requirements (20 credits)

1. An undergraduate degree. This requirement may be waived when the student can demonstrate that he has breadth of knowledge equivalent to such a degree or has completed 10 semester hours of credit with a grade of B or better from the courses listed below.
2. Completion of Accounting for Non-accountants or demonstration of equivalent understanding of accounting. A working knowledge of accounting is desirable.
3. 20 semester hours of credit with a grade of B or better.



The following courses are required unless the student has had equivalent courses in other institutions.

Federal Budget Administration (2)  
 Introduction to Public Administration (2)  
 Public Finance (3)

A minimum of 10 semester hours of credit are to be selected from the following courses.

Analysis and Interpretation of Financial Statements (2)  
 Audit Management—Seminar (4)  
 Conduct of Management Surveys (2)  
 Cost Accounting (3)  
 Federal Budgetary Procedure: Formulation and Presentation (2)  
 Federal Budgetary Procedure: Execution and Fund Control (2)  
 Federal Financial Administration (2)  
 Federal Income Taxes (3)  
 Mathematics of Accounting and Investment (3)  
 Principles of Management (3)  
 Statistical Sampling for Financial Management (3)  
 Work Standards and Work Measurement (2)

A maximum of 3 semester hours of credit are to be selected from the following courses.

American National Government (3)  
 Comparative Administration in Its Political and Social Environment (3)  
 Human Relations in Administration (3)  
 Legislative Process (2)

*A student seeking this certified statement should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. With the approval of the Registrar, courses in public administration or the social sciences may be substituted for those on the elective list. Equivalent courses will be accepted by transfer from other institutions. The student must file a transcript of his college record before completion of the program.*

4-112. Federal Fiscal Procedure (See P. 47)

4-116. Federal Budgetary Procedure: Formulation and Presentation (See P. 48)

4-118. Federal Budgetary Procedure: Execution and Fund Control (See P. 48)

6-635. Federal Budget Administration

Fall, 2 credits

ROBERT V. CUMMINS and CARL W. TILLER

Federal budgeting from advance program planning through execution of budget. Principles and policies. Budgets as instruments of congressional control and of executive management. Relationships of budgeting to other aspects of financial management and general management. Budgeting as means of public policy decision-making. Organization and management of budget staff. *Prerequisite*: Bachelor's degree or experience at Grade GS-9 or above in financial or general administration, or special permission.

## 6-525. Federal Financial Administration

Spring, 2 credits

ROBERT V. CUMMINS and CARL W. TILLER

Federal financial system and its basis. Roles of major participants (Congress, President, Department of Treasury, General Accounting Office, Bureau of Budget, and operating departments). Contributions of each phase of financial management—budgeting, accounting, financial reporting, and auditing. Policies, principles, and practices followed. Joint Financial Management Improvement Program. Progress and recent trends in financial administration. *Prerequisite:* Bachelor's degree, or experience at Grade GS-9 or above in financial or general administration, or special permission.

## Personnel Administration

### COMMITTEE

Max P. Reid, *Chairman*

Roy Colbert, Jack H. Foster, C. O. Henderson (*Vice-chairman*), Henry F. Hubbard, Harold H. Leich, Fordyce Luikart, James C. O'Brien, Ross Pollock, John A. Watts, Arnold S. Zander

These courses should be of concern to the Federal employee who is interested in a career in management. Some knowledge of the principles of public administration, such as can be acquired from the introductory course in public administration, is helpful although not required. It is also desirable that the general course, Public Personnel Administration, be taken before the specialized courses such as Position Classification, Employment and Placement, and the like. The student who is in a position classified at Grade GS-5 or below and who desires to prepare for personnel work should first take the course in Federal Personnel Procedure in the Department of Office Techniques and Operations. The interested student should not attempt to take any specialized courses until he has gained substantial experience in personnel work or has completed all the basic general courses.

4-201. Modern Supervisory Practice (See P. 46)

4-114. Federal Personnel Procedure (See P. 47)

## 6-430. Public Personnel Administration

Fall, 3 credits. Repeated in Spring

NEWELL B. TERRY

Designed for the supervisor and administrator who wish to have general familiarity with personnel work, for those in junior personnel staff positions desiring to broaden their understanding of personnel administration, and for those desiring to enter the field who need a foundation for more specialized courses in the personnel field. Primary emphasis on theory and practice of personnel administration in the Federal Government. Development and significance of personnel administration in public service. Recruitment, examination, and selection. Classification and pay concepts. Employee organizations, motivations, and training. Conduct and discipline. Role of Civil Service Commission, operating agencies, and their personnel officers. Personnel responsibilities of supervisors. Trends in personnel administration.

## 6-305. Safety Programs Management

Fall, 2 credits

THOMAS J. CRESSWELL and WILLIAM C. POPE

Designed for employment, training, property management, and general administrative personnel in Government and industry, responsible for, or engaged in, safety program management. Nature of

safety program and value for management. Answers to practical safety management problems in large and small organizations. Consideration of nontechnical aspects of safety program management, including purpose, philosophy, and objectives. Authority, policy, and functional relationships. Required elements. Accident information management. Translation of duties of safety inspector and engineer for nontechnical safety program administrator.

### 6-315. Labor Management Relations in Civil Service—Seminar

Fall, 2 credits

JOHN G. GREGG and WILSON R. HART

Background of American labor movement. Development of existing body of labor law, providing framework of United States system of collective bargaining. Applicability of collective bargaining and its various essential elements to labor management relations in public employment, particularly in Federal service. Paper and oral presentation required of each student.

### 6-330. Compensation Practices in Industry and Government

Fall, 2 credits

TOIVO P. KANNINEN

Characteristics and administration of wage and salary structures in industry and government. Methods and dimensions of pay adjustments. Wage differentials by occupation, labor market, industry, size of establishment, and unionization. Fringe benefit practices and expenditures. Role of wage incentives, bonuses, and profit sharing. Federal Salary Reform Act of 1962—comparability pay principle and its implementation. Federal wage board procedures. Sources of data on wages, salaries, and related benefits.

### 6-340. Personnel Research—Recent Developments

Fall, 2 credits

ALBERT S. GLICKMAN and FRANCIS L. HARMON

Designed for those occupying or preparing for staff or line positions. Objective to improve understanding of uses of research methods in developing more effective personnel management. Course built around recent research in such areas as tests and measurements, performance appraisal, training evaluation, motivation, and communication.

### 7-446. Personnel Psychology (See P. 83)

### 6-444. Position Classification

Fall, 2 credits. Repeated in Spring

WILLIAM C. LAXTON and JOSEPH P. FINDLAY

Fundamental concept of position classification and its uses. Relation of classification to compensation and other phases of personnel management. Analysis of Classification Act of 1949. Identification, analysis and application to specific positions of factors determining class and grade level. Job evaluation techniques. Application of position classification in Federal service including operating policies, practices, and procedures. *Prerequisite:* Introduction to Public Administration, or Public Personnel Administration, or Grade GS-4 or above in personnel work, or 60 semester hours of college work.

### 6-512. Employment and Placement

Fall, 3 credits. Repeated in Spring

JOHN R. GARNETT

Basic factors in employment market. Qualification standards, promotion, and other in-service placement programs. College recruitment, and other planned intake programs. Examination, selection, and utilization principles and practices for professional and administrative jobs. Career planning. Class discussion determined by specific student interests.

### 6-518. Employee Training and Development

Spring, 3 credits

JAMES G. STOCKARD

Development of human resources of an organization. Informal presentation of ideas for determining actual training needs and for organizing, staffing, financing, selling, evaluating, and recording



training activity. Explanation of benefits of the Government Employees Training Act (Public Law 85-507). Interpretation of training implications of manpower picture for the 1960s. Demonstration of training methods and devices meeting test of successful programs in Government and industry. For personnel technicians, budget analysts, methods analysts, and supervisors. Orientation for foreign technicians, teachers, and others whose work requires appreciation of adult training and education methods of modern business world.

6-453. Human Relations in Administration (See P. 64)

6-454. Applied Human Relations in Administration  
(See P. 65)

### Legal Administration

#### COMMITTEE

Thomas J. Flavin, *Chairman*

Ralph F. Koebel, David Reich, Ashley Sellers

6-320. Administrative Law and Procedure

Fall, 2 credits

THOMAS J. FLAVIN

Principles and practice of administrative law in the Federal field with concentration upon provisions of Administrative Procedure Act (1946) dealing with formal rule-making and adjudication and involving notice, hearing, evidence, findings, and control by the courts.

6-422. Business Law

Year, 2 credits each semester

HERBERT L. PERLMAN

Aspects of law essential to conduct of modern business. Forms of business organization, bailments, property, sales, mortgages, negotiable instruments, and contracts. The student may attend either or both semesters. No subject matter repeated.

6-427. Aviation Law

Fall, 2 credits

DENIS A. COOPER

Principles and practice of aviation law with concentration upon provisions of Federal Aviation Act of 1958. Special emphasis on rules of law governing ownership, operation, and use of aircraft, including provisions relating to formal rule-making and adjudication procedures of Federal Aviation Agency and Civil Aeronautics Board involving notice, hearing, evidence, findings, and judicial review authority.

2-145. Law Librarianship (See P. 27)

6-425. Legal Aspects of Investigation—Criminal Evidence  
and Procedure

Spring, 2 credits

RALPH F. KOEBEL

Designed to provide investigative personnel and those desiring to prepare for such work, background and insight into legal aspects of their investigations. Types of evidence to seek. Circumstances and conditions under which the evidence is to be obtained in order to have adequate probative value. How to prepare such evidence for presentation in court or for other procedure. Designed to provide understandable information without overemphasis of technical aspects. *Prerequisite:* Sufficient educational background for appointment to training position in investigational work.



- 6-370. Government Construction Contracts (See P. 73)
- 6-371. Government Construction Administration (See P. 74)
- 7-479. Economics of Merger and Antitrust (See P. 80)

## Procurement and Property Management

### COMMITTEE

Tony M. Baldauf, *Chairman*

George D. Ferrare, Kelly T. McCracken, T. Alfred Pilson, N. O. Wood, Jr.

These courses examine the ways in which the Federal Government purchases, manages, and accounts for materials and supplies. The student interested in purchasing but with limited experience in such work will find it helpful to start with the courses in Federal Property Procedure and Federal Purchasing Procedure in the Department of Office Techniques and Operations. Selected background courses in public administration together with courses in the Division of Management Analysis offer thorough training in administration in this area.

- 4-113. Federal Property Procedure (See P. 47)

- 4-115. Federal Purchasing Procedure (See P. 47)

- 6-364. Federal Contracting

Spring, 2 credits

FRANK R. ABERNATHY  
V. SAMUEL GUNTHER

Primarily for employees of civilian agencies using Federal procurement regulations. Contracting as technique of purchasing where advertising is required, including study of legal and administrative policy background of contract provisions, requirements of advertising, analysis of bids, contract award and administration, handling of disputes, appeals, protests, change orders, amendments, construction contract procedures, debarment procedures, and related subjects. Practical application by preparation of bids, contracts, orders, and related matters. *Prerequisite:* Federal Purchasing Procedure, or currently working in purchasing or contracting.

- 6-370. Government Construction Contracts

Fall, 2 credits

THOMAS M. DURSTIN, PAUL H. GANTT, and HENRY B. KEISER

Government contract law, with special emphasis on construction contracts. Principles of Government contract administration. Study of contract general and special provisions. Administration of Davis-Bacon Act, Miller Act, and other laws pertaining to construction contracts. Handling of contract modifications, changes, suspension of work, and damages. Study of landmark cases in courts, with decisions of Appeal Boards and Comptroller General. Case problems.

## 6-371. Government Construction Administration

Spring, 2 credits

PAUL H. GANTT

Consideration of complicated problems of recurring nature in Government construction administration. Study of landmark cases. Tracing of problems from inception to disposition by contracting officers and review authorities. Contract appeal boards and litigations in courts. Seminar discussion, with written materials. *Prerequisite*: Government Construction Contracts, or special permission.

## 6-373. Labor Relations in Government Procurement

Fall, 2 credits

JOHN G. GREGG

Analysis of respective roles of labor, management, and government in labor relations affecting procurement, labor statutes and labor policies in procurement process, their scope and implementation. Davis Bacon and Walsh Healey. Equal Employment Opportunity Program. Examination of missile site problem, contributing factors, analysis and evaluation of techniques for governmental intervention in labor disputes affecting procurement in normal and emergency periods.

## 6-638. Government Defense Contracts

Year, 2 credits each semester

EUGENE J. DAVIDSON

Survey and analysis of defense contracts, procurement policies, procedures, and contracting methods. Review of Armed Services Procurement Act, Armed Services Procurement Regulation, other applicable laws and regulations, and decisions of Armed Services Board of Contract Appeals, Comptroller General, Court of Claims, and United States Supreme Court. Contracting by formal advertising and negotiation. Fixed price. Cost reimbursement and incentive-type contracts. Change orders and supplemental agreements. Contract termination (default and convenience). Price re-determination and escalation. Renegotiation. Assignment of claims. Contract financing bonds, labor standards, taxation, contingent fees, and conflicts of interest. Government-furnished property and special relief legislation (P.L. 85-804, and others).

## 6-565. Inventory Management

Fall, 2 credits

J. W. PRICHARD  
LESTER J. FINVER

Principles and practices, with emphasis on inventories held to satisfy repetitive demand. Two major decisions of stock replenishment (when to order and how much). Order quantities and reorder points for specific management objectives. Various types of replenishment tables. Interrelationships of economic order quantities, demand forecasting, safety stocks, lead times, reorder points, and inventory costs. Methods of demand forecasting and requirements determination. Replenishment policies to satisfy specific management objectives, or capital, fiscal, personnel, or space constraints. *Prerequisite*: Basic algebra.

## 8-405. Principles of Specifications (See P. 91)

### Accounting

COMMITTEE

Warner H. Hord, *Chairman*

Lawrence W. Acker, Paul L. Appleman, William J. Armstrong, Robert H. Fuchs, Charles N. Mason, Sidney S. Sokol

The scope of accounting in the Federal service is wide. There are increasing demands for accountants having knowledge of commercial as well as Government accounting. These demands have come as a result of the development of the Joint Financial

Management Improvement Program in the Federal Government. The Joint Program is a Government-wide cooperative effort under the joint leadership of the Comptroller General of the United States, the Secretary of the Treasury, and the Director of the Bureau of the Budget. Its purpose is to give the President better financial management in the executive branch, the Congress better information for acting upon appropriations and other legislation, and the public a clearer picture of the financial condition and operations of the Federal Government.

#### CERTIFIED STATEMENT OF ACCOMPLISHMENT IN ACCOUNTING

The program leading to the Certified Statement of Accomplishment in Accounting is broad enough to cover not only the regular appropriation and fund accounting of the Federal Government, but also the accounting training needed for many other governmental activities. The program is comprehensive enough both to provide advanced training for the Government service, and, if courses are carefully selected, to meet the usual educational requirements for Certified Professional Accountant examinations. The student planning to take a Certified Professional Accountant examination should know the requirements of the State in which he plans to take the examination. In general, the course of study, in addition to accounting, should include the following: Business English, Business Law, Corporation Finance, Investments, Mathematics of Accounting and Investment, and Principles of Economics.

#### Requirements (36 credits)

1. Graduation from high school, or the equivalent.
2. 36 semester hours of credit with a grade of C or better, as follows:
  - a. Required courses (25 credits):
    - Principles of Accounting (6)
    - Intermediate Accounting (6)
    - Cost Accounting (3)
    - Auditing (4)
    - Advanced Accounting (6)
  - b. Electives (11 credits):
    - Analysis and Interpretation of Financial Statements (2)
    - Business Law (4)
    - Cost Accounting (Second Semester) (3)
    - Federal Budget Administration (2)
    - Federal Financial Administration (2)
    - Federal Government Accounting (4)
    - Federal Income Taxes (3)
    - Internal Auditing (4)
    - Mathematics of Accounting and Investment (3)
    - Principles of Economics (6)
    - Writing Procedures and Instructions or Official Writing (2)

*A student seeking the certified statement should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. He must file a transcript of his high school or college record before completion of his program.*

## 6-342. Accounting for Non-accountants

Fall, 2 credits

CHARLES J. STRATTON

Survey course designed to familiarize administrators, economists, lawyers, scientists, and other non-accountants with basic accounting concepts, processes, and terminology required for understanding of accounting data. Major principles and conventions of financial and cost accounting, nature and



purpose of internal (financial) control, and basic techniques of financial statement analysis and interpretation. Review of double entry, accrual accounting process as basis for understanding resulting accounting data. *Not intended for the student contemplating further study of accounting. Not accepted for credit toward the Certified Statement of Accomplishment in Accounting. Prerequisite:* Work experience in a non-accounting position at Grade GS-11 or above, or special permission.

## 6-343. Statistical Sampling for Financial Management

Fall, 3 credits. Repeated in Spring

BENJAMIN J. MANDEL

Designed for supervisory personnel in accounting, auditing, and financial management positions in Federal Government, business, and industry. Appreciation of elements of probability sampling closely related to financial management problems. Basic principles and concepts of probability sampling (standard error and sampling distribution), purposes of sample surveys, including estimation, discovery, and work sampling. Efficient techniques of sampling and their application to financial management problems. Solution of common problems encountered in fact-finding. Specific problems. Minimal mathematical and technical derivations. *Prerequisites:* Background in statistics and sampling desirable, but not required.

## 6-352A. Principles of Accounting—First Half

Fall, 3 credits. Repeated in Spring and Summer

J. VERNON BALLARD  
PAUL S. CARTER  
MARVIN H. LEVENBERG  
DANIEL E. PALENSKI

Elementary principles of accounting. Discussion and problems. At the end of the semester, the student is prepared to do accounting necessary for a small business organization; *i.e.*, keep a complete set of books, draw up statements at the end of the fiscal period, adjust accounts for accruals, deferred items, depreciation, and close the books.

## 6-352B. Principles of Accounting—Second Half

Spring, 3 credits. Repeated in Summer and Fall

J. VERNON BALLARD  
PAUL S. CARTER  
MARVIN H. LEVENBERG  
DANIEL E. PALENSKI

Continuation of first half, covering more advanced principles of accounting. Accounting for partnerships, corporations, and manufacturing. Depreciation policies and analysis of financial statements. *Prerequisite:* Principles of Accounting (First Half), or equivalent.

## 6-353A. Intermediate Accounting—First Half

Fall, 3 credits

WARNER H. HORD

Advanced principles of manufacturing accounting, corporation accounting, and valuation as applied to current assets. Fixed assets, intangibles, and liabilities. Reserves and funds. Installment sales. *Prerequisite:* Principles of Accounting, or equivalent.

## 6-353B. Intermediate Accounting—Second Half

Spring, 3 credits

WARNER H. HORD

Advanced principles of partnership accounting, including formation, operation, and dissolution. Joint ventures. Consignments. Agencies and branches. Application of funds. *Prerequisite:* Intermediate Accounting (First Half), or equivalent.

## 6-264. Federal Government Accounting

Year, 2 credits each semester

THOMAS C. CANADA

First semester: Financial organization for performance of accounting and its relationship with Department of the Treasury and General Accounting Office. Practice work with basic ledgers (allot-



ment ledger, object classification ledger, and general ledger) maintained in connection with funds available to Federal agencies. Appropriation, apportionment, allotment, obligation, disbursement and collection processes. Relationship of accounts maintained in the agency with accounts maintained by Department of the Treasury. Reconciliation of cash accounts with statements furnished the agency by that department. Relationship between general ledger control accounts and subsidiary records. Second semester: General ledger, but involving more complex transactions such as inventory accounting. Accounting in decentralized operation. Accrual accounting concepts as applied to appropriated funds. Year-end closing of accounts and financial reporting and its relationship with Department of the Treasury. Study of accounting problems with emphasis on principles of controls and recent developments in accounting in the Federal Government. In each semester, as applicable, discussion of related reporting and accounting procedures and applicable General Accounting Office instructions. *Prerequisites*: Principles of Accounting and Federal Fiscal Procedure, or equivalent, or experience in accounting operations.

## 6-420. Advanced Accounting—Theory and Problems

Year, 3 credits each semester

LAURENCE W. ACKER

Advanced principles of accounting and their application to specific problems. Consolidated statements. Foreign exchange. Receivership. Estates and trusts. Public accounts. Emphasis on problems in accounting theory and practice as generally given in Certified Professional Accountant examinations. *Prerequisite*: Intermediate Accounting, or equivalent.

## 6-423. Mathematics of Accounting and Investment

Spring, 3 credits

CHARLES N. MASON

Calculation of compound interest, compound discount, amount and present value of annuities, including perpetuities and capitalization methods of determining valuation. Accumulation of sinking funds and amortization of debts by equal payments, with applications to open-end mortgages. Yield and valuation of bonds, various depreciation methods, and exact and approximate methods of determining interest rates charged on time purchases and small loans. Life probabilities and calculation of premiums and cash values for commoner types of life insurance and annuities. Discussion of accounting applications and entries upon request. *Prerequisite*: Intermediate Algebra, including use of exponents and logarithms, or equivalent.

## [6-510.] Analysis and Interpretation of Financial Statements (1965-66 and alternate years)

Spring, 2 credits

INSTRUCTOR TO BE ANNOUNCED

Methods and techniques of preparing, analyzing, and interpreting financial statements of business and Government enterprises, particularly working capital and revolving funds and Government-owned corporations. Nature and limitations of financial statements, and terminology, content, and organization, and determination and interpretation of trends and ratios for both internal and external users of financial statements. *Prerequisite*: Principles of Accounting.

## 6-525. Federal Financial Administration (See P. 70)

## 6-642. Cost Accounting (1964-65 and alternate years)

Year, 3 credits each semester

JAMES H. LOBB

Principles of cost accounting, together with methods of application to specific problems. Consideration of methods of cost accounting for materials, labor, direct and indirect expenses in relation to specific job orders. Process, departmental, and standard costs. Control accounts. *Prerequisite*: Principles of Accounting.

## 6-645. Federal Income Taxes

Fall, 3 credits

LLOYD W. HAMILTON

Principles of Federal income taxation applied to individuals, partnerships, and corporations for determination of gross income, deductions credits, and exemptions. Forms of various tax returns. Application of principles of accounting.

## 6-684. Internal Auditing (1964-65 and alternate years)

Year, 2 credits each semester

LEONARD H. GREESS and BENJAMIN F. ROBINSON

Philosophy and purpose of internal audit. Emphasis on use of function as aid to management and operating officials in the Federal Government. The course reflects current concept that internal auditing is an important management control that functions by review and appraisal of other management controls. Topics covered: Appraisal of adequacy of policies, plans, and procedures. Compliance with policies, plans, procedures, regulations, and laws. Proper safeguarding and accounting for agency assets. Ascertaining reliability of accounting and supporting statistical data. Development and utilization of internal audit in the Federal Government. Placement of internal audit function in the organization, its relationship to line operations and line inspections, and its relationship to external audits. Staffing and organization of an internal audit unit, planning of audits, techniques for performance of audits, audit manuals, and reports. Use of case studies and illustrations drawn from experiences in Government agencies. Guest lecturers. *Prerequisite*: Experience in internal audit, administrative or management analysis at Grade GS-7 or above, or courses in advanced accounting or auditing.

## [6-693.] Auditing (1965-66 and alternate years)

Year, 2 credits each semester

LEONARD H. GREESS and BENJAMIN F. ROBINSON

Principles and practices involved in commercial-type audits. Consideration of purposes and types of audits. Auditing concepts and standards. Review of internal controls. Planning performing audits. Case studies and problems in auditing theory and practice similar to those included in Certified Professional Accountant examinations. Utilization of audit principles in audits of operations of agencies in the Federal Government. *Prerequisite*: Intermediate Accounting.

## 6-650. Audit and Investigation Management—Seminar

Year, 2 credits each semester

LEONARD H. GREESS

Discussion of executive, mid-management, and line-management responsibilities in internal audit and investigation function under broad and dynamic management mandate. Starting with placement of function in total organization, discussion of pros and cons of alternate elements, basic policies, and procedures to govern operations. Development of position descriptions for personnel employed at management levels in this activity, providing the student with opportunity to consider qualifications and grades of personnel to be employed. *Prerequisites*: Experience in internal audit and investigation, or in administrative or management analysis at Grade GS-12, or above.

# Social Sciences

## DEPARTMENTAL COMMITTEE

Bushrod W. Allin, *Chairman*

John M. Brewster, John M. Curtis, Joseph L. Fisher, Cannon C. Hearne, Sherman E. Johnson, Erven J. Long, Kenneth E. Ogren, Harold B. Rowe, Harry C. Trelogan (*Vice-chairman*), Frederick V. Waugh, Bennett S. White, Jr.

The problems of social organization and operation have become both absolutely and relatively more important with the increase in the complexity of our industrial civilization. As a consequence, the Federal departments and agencies, as well as governments at state and local level, have need for personnel adequately trained in the social sciences. Moreover, the individual as consumer and investor, the businessman and the farmer as producer, also find need for knowledge of economics and the social sciences. Large corporations employ economists to help in the formulation of policy. Psychologists and social workers find demand for their services in personnel work.

To meet the needs of the Federal employee in particular and of other groups as is feasible, the Department of Social Sciences offers the following courses designed to aid the student in acquiring general background in the social sciences as well as specialized training in fields for which there is current demand.

## Economics

### COMMITTEE

Kenneth E. Ogren, *Chairman*

James P. Cavin, Howard S. Piquet, Harry E. Steele, Frederick D. Stocker,  
William A. Vogely

Adequate foundation training in general economics is essential for satisfactory accomplishment in the study of any specialized branch of the subject. Hence, the primary objective in developing the following courses has been that of providing the basic work needed by students who wish to carry out a systematic plan of study, at both undergraduate and graduate levels.

## 7-201. Principles of Economics

Year, 3 credits each semester

THOMAS F. HADY

Designed to familiarize the student with basic tools of economic analysis and their application to questions of economic policy. First semester: Resources, production, and capital formation. Business organization and finance. Money and the banking system. Volume of economic activity and control of fluctuations. Second semester: Functioning of price system. Distribution of national income. International economics. Economic growth. While it is advisable that students registering for the second semester should have completed the first semester, qualified students may be admitted at mid-year.



## 7-548. Economic Analysis

Year, 3 credits each semester

CLARK EDWARDS

Use of basic tools of economic analysis. Understanding intermediate economic theory and methods used to solve economic problems. First semester: Macro-economics. Analysis of general determinants in American economy of income, employment, production, price level, growth, and cyclical change. Second semester: Micro-economics. Analysis of individual consumer demand, market structure, and theory of firm. Inquiry into general determinants of relative prices and income distribution. Review of elementary principles. The student may attend either or both semesters. *Prerequisites:* Principles of Economics and some acquaintance with elementary algebra.

## 7-570. Introduction to Econometrics (1964-65 and alternate years)

Year, 3 credits each semester

MARTIN E. ABEL

First semester: Mathematical and statistical concepts used in solution of econometric models. Theory of least squares. Formulation of econometric models. Estimation of parameters of models by least squares. Interpretation and use of estimates. Second semester: Formulation of simultaneous equation models. Methods of estimating parameters and applications. Special problems of formulation and estimation. *e.g.*, serial correlation. *Prerequisites:* Principles of Economics, Mathematics for Economists, or equivalent, and course in statistics including regression analysis.

## 7-476. Public Finance

Spring, 3 credits

FREDERICK D. STOCKER

Economics of government finance, taxing, borrowing, and spending by Federal, State, and local governments. Emphasis on basic principles and tools of analysis, with current policy issues for illustration. Economics of government spending, allocation of resources between public and private sectors, borrowing and the public debt, fiscal policy, and taxation. General principles of taxation, incidence, and the like. Problems of specific types of taxes. *Prerequisite:* Principles of Economics, or equivalent.

## 7-479. Economics of Mergers and Antitrust

Spring, 2 credits

JOHN J. HURLEY

Economic theory and working of antitrust laws of United States. Business concentration. Market structures. Monopolization and conspiracy mergers. Patents and antitrust. International cartels. Price discrimination. Antitrust remedies.

## 3-509. Mathematics for Economists (See P. 38)

## 7-480. Money and Banking

Spring, 3 credits

HARVEY SHAPIRO

Designed to help the student understand functions of money and credit in modern economy. Functions of money. Commercial bank operations and creation of credit. Monetary theory. Principles and practices of central banking and credit control. Role of money in relation to employment, prices, and business cycles. International monetary relations. *Prerequisite:* Principles of Economics, or equivalent.

## 7-526. Introduction to International Economics

Fall, 3 credits

CAREY B. SINGLETON, JR.

Basic concepts and analytical tools and their application to international economics. Introduction to theory and empirical foundations of international trade and factor movements. Theory of multi-country, multicommodity trade. Problem of international disequilibrium. Public and private barriers to trade and monopoly of international trade. Search for economic stability and growth through international cooperation. International Monetary Fund. International monetary system.



Problem of underdeveloped areas—meaning and extent of economic underdevelopment. Role of international trade and aid in economic development. Future of international economic relations. *Prerequisite*: Principles of Economics, or equivalent.

## 7-528. International Trade and Commercial Policy

Spring, 3 credits

WILLIAM B. KELLY, JR.

Balanced treatment of theory and practice of international trade and commercial policy, with emphasis on United States. Classical and modern theories of international trade. Balance of payments and adjustments under fixed and fluctuating exchange rates. Tariffs, quotas, trade, and the like. Customs union theory and European Economic Community (EEC), European Free Trade Association (EFTA), and Latin American Free Trade Association (LAFTA). General Agreement on Tariffs and Trade (GATT) and United States trade policy. *Prerequisite*: Principles of Economics.

## 7-580. Comparative Economic Systems

Fall, 3 credits

CAREY B. SINGLETON, JR.

Theory of socialism, Soviet governmental and social system. Structure of Soviet economy. Soviet system of planning and operation. British socialism in operation. Rationale of capitalism. Modern industrialism. Clash of economic systems in competition.

## 7-469. Economics of Cooperative Enterprise

Fall, 3 credits

MARTIN A. ABRAHAMSEN

Analyses of cooperative principles and practices. Appraisal of economic forces leading to cooperative development. Evaluation of role of cooperatives in economy. Types of cooperatives and special legal, organizational, managerial, membership, and financial problems relating to cooperative performance.

## 7-468. Economics of Transportation

Fall, 3 credits

IVON W. ULREY

Survey of past, present, and probable future economic development of nation's rail, highway, water, pipeline, and air transportation systems. Effects of Federal and State regulation on transportation. Growth of inter-modal competition and its impact on industry and agriculture. Emphasis on theory and practice of rate-making and cost-finding. Analysis of sources and uses of capital. Identification of gaps in transportation data and need for transportation research. *Prerequisites*: Principles of Economics and course in statistics, agricultural economics, marketing, or transportation.

## 8-375. Engineering Economics

(See P. 91)

## 7-780. Theories of Economic Growth

Spring, 2 credits

WILLIAM E. HENDRIX

Systematic study of economic growth problems and principles. Definitions and elements of economic growth, with emphasis upon natural resources, population, capital, technology, markets, and institutions. Economic growth models under varying stages of development and varying market and institutional limitations. Foreign and domestic applications.

## 7-414. Economics of Marketing (1964-65 and alternate years)

Year, 2 credits each semester

PAUL E. NELSON and HARRY C. TRELOGAN

Designed to portray and interpret marketing and marketing problems within modern setting. Emphasis on interrelationships between market and other fundamental institutions of economy, and on organization, conduct, and performance of markets. Analysis of relevant theories relating to firm behavior, ranging from pure competition to oligopoly and monopoly. Primary but not sole attention to farm products. Seminar or problem-solving orientation in second semester. *Prerequisites*: Introductory courses in economics and statistics and basic course or experience in marketing field.

## 7-457. Economics of Agricultural Development

Year, 3 credits each semester

RAYMOND P. CHRISTENSEN

Designed primarily for foreign students. Survey course in economics of agriculture, with special emphasis on role of agriculture in national economic growth. First semester: Principles and elementary tools of economic analysis applicable to agricultural production and marketing problems and with effects of technological improvements, institutional arrangements, and other factors affecting economic progress in agriculture. Second semester: In greater detail, identification of economic problems in agriculture and development of effective research procedures for use in analysis of these problems. Emphasis on application and adaptation of research methods used in United States to economic problems of agricultural development in foreign countries.

## 7-434. Commodity Prices: Economic and Bargaining Bases (1964-65 and alternate years)

Year, 2 credits each semester

HAROLD F. BREIMYER

Designed to blend modern price theory and institutional elements in price-making. Classical, neo-classical, and institutional concepts of price-making process. Distinction between bargaining transaction in market and short- and long-run production responses as influences on price. Role of price support in price-making for agricultural commodities, both storable and perishable. Not methodological course, but acquaints student with analytical techniques appropriate to particular problems. *Prerequisites*: Introductory courses in economics and statistics.

## [7-716.] Agricultural Policies and Programs—Seminar (1965-66 and alternate years)

Spring, 2 credits

WALTER W. WILCOX

Analysis and evaluation of current agricultural policies and programs with special reference to planning and programming techniques and processes, including review of policy and program development from First World War to date. Consideration of agricultural policies and programs in relation to economic principles as well as chief trends or forces operating within national economy as a whole. Effort to consider all the main streams of agricultural policy, including problems relating to research, education, and marketing, as well as farm price supports. *Prerequisite*: Bachelor's degree in agriculture or related field, with some courses in economics, or operational responsibility in agricultural programs.

## 7-2. How and Why of Stock Investments I

Fall, non-credit

ARTHUR A. EBENFIELD

Designed to teach the investor fundamental principles of investing in modern securities markets. All aspects of stock market operations. Investment decision-making. Correlation of broader aspects of operations of brokerage firms and members of New York Stock Exchange with what the investor should know about internal operations of stock market. Use of films to supplement lectures.

## 7-3. How and Why of Stock Investments II

Spring, non-credit

ARTHUR A. EBENFIELD

Tools of analysis for individual investor and their application, including preparation of specific analyses. *Prerequisite*: How and Why of Stock Investments I, or general knowledge of securities and trading.

## 7-465. Security Analysis

Year, 3 credits each semester

J. ARNOLD PINES

Principles and technique of security analysis employed by the analyst, with particular reference to analysis of financial statements. Selection of fixed income securities for investment. Valuation of common stocks. *Prerequisites*: Two years of college work in corporate finance, or investments, or accounting, or equivalent.

## Human Relations

### COMMITTEE

John M. Brewster, *Chairman*

Lee K. Buchanan, Joseph Green, Jr., James O. Howard, Franklin P. Kilpatrick, Conrad F. Taeuber

The following courses in human relations and related areas are designed to meet a number of needs on varying levels. Some are for those who want to add to their general knowledge of social problems and processes. There are also courses for the student at the elementary undergraduate level, as well as at the specialized undergraduate and graduate level. Finally, for the mature person, there are courses that try to use the knowledge of all the social sciences in considering public issues and policy.

### 7-210. General Psychology

Fall, 3 credits. Repeated in Spring

RICHARD S. FITZPATRICK  
SYLVAN J. KAPLAN

Psychological theory and principles, based on experimental fact and observation, and interpretation of human relations beginning with development and capabilities of human personality. Adjustment of the personality to environment. Lack of proper adjustment and resulting varying degrees of mental illness calling for psychotherapy. How man sees his world. What influences his relations with his environment. Examination of these relations in selected human situations: Marriage, job, and such problem areas as delinquency, crime, and addiction. The student takes a selected group of psychological tests.

### 7-235. Introductory Social Psychology

Fall, 3 credits. Repeated in Spring

RICHARD D. BLOOM

Review of basic psychological concepts of cognition and motivation and their use in understanding social behavior. Examination of certain aspects of social psychology including attitude, attitude change, nature and modification of prejudice, and group processes. *Prerequisite*: General Psychology, or equivalent.

### 7-446. Personnel Psychology

Fall, 3 credits. Repeated in Spring and Summer

JOHN R. BOULGER

Designed for those in supervisory positions interested in improving personnel management by use of personnel systems and procedures based on socio-psychological principles. Application of methods of behavioral sciences to problems of labor, industry, business, and community. Emphasis on personnel psychology: Recruitment, psychological testing, selection, training, rating, evaluation, and career development of employees. Leadership and morale. Organizational environment.

### 7-462. Educational Psychology

Fall, 2 credits. Repeated in Summer

JOHN R. BOULGER

Current critical problems in education. Research oriented. Topics: Current methodology in educational psychology. Research on characteristics of effective teachers. Factors influencing interest and motivation. Over- and under-achievement. Programmed instruction. Creativity and high level talent. School dropouts.

### 7-544. Psychology of Creative Individuals

Year, 2 credits each semester

REZA ARASTEH

Open to counselors, teachers, and therapists, graduate students, and others wishing to gain insight into process of creativity and human life. First semester: Formulation of psychological theories, mechanisms, and characteristics of creativity in relation to integrated personality. Second semester: Analysis of creative individuals from various cultures through their works, showing



manifestation of integrated personality despite time, place, and degree of culture. *Prerequisites:* Understanding of creativity through experience in art, science, or invention, or psychological and literary background.

### 7-304. Conditions of Personality Growth (1964-65 and alternate years)

Fall, 2 credits

EUGENE STAMMEYER

Principal factors influencing personality development. Physiological bases, early experiences, and cultural determinants. Experimental and clinical contributions to study of personality and their application to practical problems of understanding and dealing with people.

### 7-442. Personality Integration and Problems in Living

Spring, 2 credits

ALBERT C. CORNSWEET

Aspects of personality that contribute to emotional integration of the person. Global and dynamic nature of personality development. Social, economic, culture, environmental, and experimental factors in living. Contributions of variations in these factors to fluctuations in behavioral patterns and difficulties in problems of adjustment and living. Schools of thought contributing to theories of personality. Exploration of these theories as alternate means of dealing with special problems in daily living. Designed to bring about mature comprehension of behavioral variations with recognition and methods of appropriately dealing with them.

### 7-541. Improving Human Relations and Group Behavior

Fall, 2 credits. Repeated in Spring

CARL F. BAUER

Emphasis on importance of recovering personal identity and responsibility in our mass civilization. Organic experience of organized materials of the course through practice in methods, techniques, and skills of "Group Dynamics." Team method of training leaders, face-to-face analysis, free association, non-directive and developmental discussion, problem census, group decision method, informality, and interviewing.

### 6-453. Human Relations in Administration (See P. 64)

### 7-303. Child and Adolescent Psychology (1964-65 and alternate years)

Spring, 2 credits

EUGENE STAMMEYER

Development of human behavior from prenatal period through adolescence in terms of processes of physical, mental, emotional, and social growth in the individual. Emphasis on interactions of total personality of the child.

### 7-714. Emotionally Disturbed Child

Summer, 3 credits

RICHARD S. FITZPATRICK

Biological, psychological, and sociological factors contributing to development of emotional disturbance in children with some emphasis on faculty parent-child relationships. Mental retardation as factor in emotion disturbance. Emotionally disturbed child at home, school, and in community. Problems of diagnosis. Parental attitude as factor in initiation of treatment. Treatment alternatives with some emphasis on group psychotherapy. Treatment settings with some emphasis on residential treatment center. *Prerequisites:* Graduate standing and present employment in teaching or working with children.

### 7-731. Clinical Child Psychology—Practicum

Fall, 3 credits. Repeated in Spring and Summer

RICHARD S. FITZPATRICK

Practical supervised instruction in testing, treatment, recreational, rehabilitation, and staffing aspects of program of community mental health facility. Equivalent of two days each week for 16 weeks. Requirements may be fulfilled evenings and week ends. *Prerequisites:* Bachelor's degree in psychology or special education, some graduate courses in psychology, and special permission.



## 7-710. Abnormal Psychology

Spring, 3 credits

RICHARD S. FITZPATRICK

Behavior pathology as background for teachers, supervisors, and others dealing with people in effort to assist in early recognition of emotional disorders and to improve adjustment of individual in group setting. History and approaches to study of abnormal behavior. Personality development. Causative factors. Diagnostic categories of abnormal behavior. Treatment and prevention of mental illness. *Prerequisite*: General Psychology.

## 7-701. Psychological Literature—Seminar

Fall, 3 credits

RICHARD S. FITZPATRICK

Seminar based on seven books in psychology, including those of Freud, Jung, Lindner, and others. Designed for the advanced student, the teacher, and the personnel and counselling psychologist who want to evaluate motivational factors in everyday situations, utilizing new look at psychological theory. *Prerequisites*: Bachelor's degree, courses in psychology, or appropriate experience and special permission.

## 7-600. Readings and Papers in Human Relations

Fall, 3 credits. Repeated in Spring

RICHARD S. FITZPATRICK, Coordinator

Under guidance of a social scientist, supervised readings with monthly conferences on topics in an area of interest to the student, or individual research and a paper on a problem in human relations. Readings, or the problem to be investigated, are determined in consultation with an advisor. *Prerequisite*: Bachelor's degree, or special permission.

## 7-400. General Semantics

Fall, 2 credits

FRANK R. ELDRIDGE

How we detect meaning, evaluate it, and communicate it to others. How we may become more perceptive as observers, more effective as evaluators, and more explicit as communicators. Devices for realizing how we react to language, how we evaluate it, and how we use it to communicate. Mechanisms that cause confusion of meaning. Clarification by understanding of useful devices and theories applied as tools of analysis, evaluation, and communication.

## 7-466. General Semantics—Seminar

Spring, 2 credits

FRANK R. ELDRIDGE

Discussion of works of Korzybski. Application of his theories and analyses of written material using general semantic techniques. *Prerequisite*: General Semantics, or equivalent.

## 7-545. Counseling Techniques

Fall, 3 credits

ALBERT C. CORNSWEET

Survey of theoretical and practical aspects of techniques used in guidance and counseling. Consideration of various schools of thought as related to behavior modification. Emphasis in areas helpful to individuals in fields of counseling, teaching, personnel work, and industrial management. Problem areas and recurring situations in interpersonal relations. Current and basic techniques utilized in direct and indirect counseling methods. Modes of verbal communications. Value of interview material. Assistance to and development of skills to meet exigencies of human factor in teaching, personnel operation, counseling, and industry. Case histories. Individual contributions by students. Also designed to assist individuals to recognize and deal with problem areas in human behavior. Understanding of dynamics of human behavior pertinent in development of these counseling techniques.

## 7-556. Career Development for Federal Employees—Seminar

Fall, 2 credits. Repeated in spring

FRANK G. JOHNS

Designed to acquaint individual Federal employee with various types of career management programs and to afford opportunity for development and analysis of individual career plans. Use of appraisal techniques. *Prerequisite*: Bachelor's degree, or equivalent.

## 7-550. Programmed Learning

Fall, 3 credits. Repeated in Spring

SYLVAN J. KAPLAN

Designed to present three aspects of programmed learning. Historical antecedents from psychology and education. Learning theory and relationship of reinforcement and *Gestalt* psychology and education. Techniques of auto-instructional program. *Prerequisite*: Six semester hours in psychology.

## 7-464. Computers in Behavioral Sciences

Fall, 3 credits. Repeated in Spring

DAVID J. FITCH

How to tell modern computers to solve some problems of prediction and classification in behavioral sciences. Languages available allowing instructions to be written in manner convenient for user without need to learn more difficult machine language. *Prerequisite*: Course in statistics. No previous experience with computers assumed.

## 7-741. Human Learning—Seminar

Year, 2 credits each semester

J. JAMES MCPHERSON

Exploration of past and current studies of human thinking and learning. Relation of these findings to interests of students in specific problems in education, communication, psychology, and research. *Prerequisite*: Advanced degree in communications, or education, or psychology, or special permission.

## 7-538. World Population Trends and Problems

Spring, 3 credits

JACOB S. SIEGEL

Population trends and prospects in United States as compared with other areas of the world. Malthusian and subsequent theories of population growth. History of growth and distribution of world's population. Trends in fertility, mortality, and migration, and their analysis in relation to social, biological, psychological, and especially, economic factors. Relation of population growth to economic development and resources. Concept of optimum population. Aesthetic considerations in population growth. Development of national population policies. Population prospects in United States and other countries. Implications for international relations. *Prerequisites*: Training in social sciences and statistics.

## 7-539. Population and Manpower

Spring, 3 credits

DENIS F. JOHNSTON

Basic concepts and techniques for measuring manpower potentials and labor force. Comparative data on current trends in population, manpower, and labor force in selected industrial and developing countries. Demographic factors as determinants of growth of manpower and labor force. Relation of manpower to labor force: Social and economic determinants of labor force participation in the United States and other selected countries. Techniques in analysis of characteristics and composition of United States labor force. Population and labor force projections and their use in planning. *Prerequisites*: One semester of statistics, one semester of economics, and Introduction to Population Statistics.

## 7-640. Medical Sociology I

Fall, 3 credits

SAMUEL A. KRAMER

Impact of disease on concepts and structures of social groups. Health and illness affecting and affected by United States cultural patterns. Socio-economic conditions. Folkways. Other fac-

tors involved in recognition, availability, and acceptance of medical services through private practice, hospital, clinic, and public health activities. Social stratification and prevailing medical practices. Changing status of medical profession.

## 7-642. Medical Sociology II

Spring, 3 credits

SAMUEL A. KRAMER

Social and cultural implications of disease. How the community reacts to the sick. Expectations about and by the physician. Medical education as social process. Healing practitioners. Nurse and chiropractor as subprofessionals. Doctor-patient relationships. Social stratification and psychiatry. *Prerequisite*: Medical Sociology, or equivalent.

## 7-706. Sociological Literature—Seminar

Fall, 3 credits

DENIS F. JOHNSTON

Seminar based on readings from works of earlier and contemporary sociologists, including Durkheim, Mannheim, Merton, Parsons, Sorokin, and Weber. Relation between theory and research stressed. Designed for advanced students wishing to broaden familiarity with major contributions and underlying concepts of modern sociology. *Prerequisites*: Bachelor's degree and courses in sociology, or advanced study in closely related discipline.

## 7-542. Russia: Yesterday, Today, and Tomorrow

Year, 3 credits each semester

ANTHONY F. CZAJKOWSKI

Survey of political, economic, social, and ideological forces in history of Russia influencing current policies. Examination in detail of Soviet expansion after 1945 and events since accession of Khrushchev.

## 7-299. Philosophy and Modern Man

Fall, 2 credits. Repeated in Summer

ALEX RODE

Study of ancient and contemporary philosophy as influence on modern thought. Designed to acquaint the beginning student with 10 major philosophers and their successors who have affected and continue to affect the manner in which we shape our destiny. Plato, Aristotle, Augustine, Aquinas, Luther, Descartes, Kant, Rousseau, Marx, and Nietzsche.

## 7-309. Introduction to Existentialism

Spring, 2 credits

ALEX RODE

Study of major figures of movement. Philosophers Heidegger, Jaspers, and Sartre. Theologians Buber, Kierkegaard, Marcel, and Niebuhr. Psychoanalysts Frankel and May. Writers Camus, Hesse, Kazantzakis, and Mailer. Understanding of existentialism as methodology rather than as closed-system philosophy.

## 6-250. American History to 1865

(See P. 65)

## 6-251. American History Since 1865

(See P. 65)

## 5-437. History of Science in United States

(See P. 51)



# Technology

DEPARTMENTAL COMMITTEE

John P. Craven, *Chairman*

Edward S. Cobb, Evan L. Flory, Garnet W. Jex, Rowland Lyon, E. S. Massie,  
Henry A. Sawchuk, J. P. Schaenzer, G. C. Tewinkel, Robley Winfrey

Many departments and agencies of the Federal Government are engaged in programs involving in varying degrees engineering techniques and professional engineers. Among these programs are housing, rural electrification, electric power development and transmission, the application of electronics to industry and transportation, soil conservation, highway planning and construction, and mapping and photogrammetry. Workers in these areas must master numerous functions that require intimate and systematic working knowledge not provided in the standard college engineering and related technical course of study.

Basically, education in engineering schools is limited by necessity and tradition to a period of four or five years. This relatively short training period is sufficient for the mastery of only a minimum of the basic sciences. There is little time for courses that give the technical student an understanding of the social and economic problems of the world around him. As a result, he often fails to appreciate the impact upon society of the advances of his profession. Technological techniques and practices are moving forward at an ever increasing rate. New developments in the sciences and engineering require the enlargement and constant reorientation of the technical background of the engineer.

The Graduate School, with the aid of representatives of Government departments and agencies and of the local chapters of engineering societies, offers courses especially adapted to the technical, professional, and administrative background of engineers in the Federal Government. Because of the competence and experience of the instructors in their respective fields, many of the courses give training in current techniques that the colleges and technical institutes cannot provide. These help the student to broaden his background, to increase his efficiency, and to develop his professional capacity.

## Engineering

COMMITTEE

Henry A. Sawchuk, *Chairman*

Walter M. Carleton, Joseph T. Garofalo, J. H. Gehring, Ferdinand Kaufholz, S. D. Keim,  
Clifford J. Leahy, E. J. Peterson, John H. Rixse, Jr., F. F. Snyder, Robley Winfrey  
(Vice-chairman)

If there is sufficient demand, courses similar to the Electrical Engineering Review for P. E. Examination can be given in other engineering fields for the student who wishes to review for the District of Columbia Professional Examinations.

### 8-92. Review of Engineering Fundamentals for P. E. Examination

Fall, non-credit. Repeated in Spring

JOHN H. RIXSE, JR.

Refresher course in basic sciences and engineering principles intended to assist in preparation for basic portions of District of Columbia Professional Engineer's License Examination (not specific branches of engineering). Covers elements of strength of materials, structures, fluid mechanics, mechanical engineering, electrical engineering and engineering economics. *Prerequisite:* Preferred, those qualified to take the examination.



## 8-95. Electrical Engineering Review for P. E. Examination

Fall, non-credit. Repeated in Spring J. J. A. JESSEL, NORMAN JOFFE, and ALMON D. THOMAS

Refresher course for the student preparing for the D. C. Professional Engineer's License Examination in field of electrical engineering with emphasis on power. Solutions of practical problems. *Prerequisite*: Preferred, those qualified to take the examination.

## 8-98. Mechanical Engineering Review for P. E. Examination

Fall, non-credit. Repeated in Spring BRIAN R. JESSOP

Refresher course for candidates preparing for Professional Engineer's License Examination in field of mechanical engineering. Emphasis on solution of advanced problems in fields of hydraulics, mechanics, structure design, and power applications. *Prerequisite*: Preferred, those qualified to take the examination.

## 8-96. Public Utilities Regulation and Rates

Spring, non-credit

LOUIS ZANOFF

Regulation of natural gas and electric utilities.

## 8-97. Mathematics for Applied Electricity

Fall, non-credit

DAVID ASKEGAARD

Mathematics most commonly used in applied engineering, especially electricity and electronics. Use of slide rule for multiplication and division. Scientific notations for large and small numbers. Use of simple algebraic equations, logarithms, elementary trigonometry, and complex numbers. Addition, subtraction, multiplication, and division of vectors. Helpful for course in Principles of Electricity. Recommended for the student planning to do additional work in field of electricity, unless he has already studied algebra and trigonometry.

## 8-110. Principles of Electricity

Spring, 2 credits

DAVID ASKEGAARD

Principles of electricity, emphasizing alternating currents. Basic units such as voltage, current and power and their measurement, resistance, voltage regulation, line loss, power factor, and three phase systems. Function of equipment used on rural electric distribution systems such as generators, substations, transformers, lightning arrestors, fuses, and oil circuit reclosers.

## 8-275. Symmetrical Components

Fall, 3 credits

BENJAMIN F. SLINGLUFF

Introduction to use of symmetrical components for analysis of positive, negative, and zero sequence components of unbalanced three-phase circuits during three-phase, two-phase, two-phase to ground, and single-phase to ground fault conditions. Involves use of per unit and per cent quantities and representation of sequence quantities on network analyzers.

## 8-280. Electric Power System—Fault Analysis and Application of Protective Relays

Spring, 3 credits

BENJAMIN F. SLINGLUFF

Study of theory and operation of electric power system components, both static and rotating, during abnormal unbalance caused by unbalanced system loads and fault conditions. Includes application of protective relays to limit extent of equipment damage and to reduce outage time. Relays covered include overcurrent, impedance, differential, voltage, negative sequence, loss of field, pilot relaying (wire, carrier, microwave), and local and remote back-up.

## 8-715. Electric Power Transmission

Year, 3 credits each semester

R. J. MATHER and ASSOCIATES

Design and construction of electric power transmission lines and systems and associated operations, maintenance, and economic considerations. Present and future transmission needs. System analysis. Stability (steady state and transient). Load flow. Interconnections. Lightning. Switch-

ing. National standards. Structures. Conductor. Hardware. Grounding. Relaying. Communications and control systems. Line layout. Plan and profile. Construction techniques. Materials handling. Engineering inspection and supervision. *Prerequisites:* Engineering degree or equivalent experience, preferably including basic courses in electrical engineering.

## 8-465. Applied Electronic Theory

Year, 3 credits each semester

JOHN J. CULLINANE

Analytical presentation of principles of electronics. First semester: Elementary circuit analysis involving linear, passive components. Characteristics of resonant circuits, transformers, transmission lines, and antennas. Fundamental principles of electron tubes including diodes, triodes, and pentodes. Voltage amplification. Second semester: Untuned and tuned amplifiers. Class A, B, and C power amplifiers. Rectifiers and power supplies. Sine-wave oscillators. Amplitude modulation and detection. Frequency modulation. Transmitters. Receivers including superheterodyne. Basic pulse circuits. Television fundamentals. *Prerequisites:* Mathematics for Applied Electricity and Principles of Electricity, or equivalent college level courses in DC and AC circuits, algebra, and trigonometry. Calculus helpful, but not necessary.

## 8-525. Transistor Electronics

Year, 3 credits each semester

CARLYLE V. PARKER

First semester: Semiconductors and p-n junctions. Transistor construction and characteristics. Small-signal equivalent circuits. Bias stability and thermal considerations. Low frequency and power amplifiers. Second semester: High frequency amplifiers. Noise models. Large-signal equivalent circuits. Transient and steady-state response. Transistors as switches. Logic circuit analysis. *Prerequisites:* Applied Electronic Theory and mathematics through calculus.

## 8-526. Advanced Transistor Circuits

Summer, 2 credits

CARLYLE V. PARKER

Large-signal equivalent circuits. Transient and steady-state calculations. Transistors as switches. Transistor logic circuits. *Prerequisite:* Transistor Electronics, or equivalent.

## 8-100. Servomechanisms

Fall, 3 credits

JAMES W. TITUS

Basic theory of linear servomechanisms and methods for analysis and design of practical systems. *Prerequisites:* Mathematics through differential equations and physics; Mechanics and elementary electric circuits.

## 8-105. Radar Systems Engineering

Fall, 2 credits

WILLIAM F. TRISLER

Principal components of radar systems. Interrelations of various parameters that affect radar range. Survey of various types of radar systems. Applicability of these to perform particular tasks. *Prerequisite:* Bachelor's degree in engineering or physical sciences, or equivalent professional experience.

## 8-690. Nuclear Reactors

Fall, 2 credits

FRED SCHULMAN

Nuclear physics review. Reactor physics. Radioactivity. Types of reactors. Elementary design considerations. Properties of materials related to reactor technology. Biological effects of radiation. Reprocessing of fuels. United States and foreign reactor programs. *Prerequisite:* Bachelor's degree in science or engineering, or special permission.

## 8-101. Introduction to Metallurgy (1964-65 and alternate years)

Fall, 2 credits

BLAKE M. LORING

Winning of metals from ore, including iron and steel, copper, lead, zinc, and less common metals. Basic principles of physical metallurgy, including mechanical properties, heat treatments, recrystalliza-

tion phenomena, and equilibrium diagram. Basic characteristics governing wide range of metallurgical processes. Designed especially for the non-metallurgist and the undergraduate. *Prerequisites*: College chemistry and physics, or special permission.

### [8-705.] Nuclear Metallurgy (1965-66 and alternate years)

Spring, 2 credits

BLAKE M. LORING

Physical metallurgy of materials for nuclear power reactors. Alloy diagrams of thorium, uranium, and plutonium. Preparation, investigation, and use of fissionable materials including precautions in handling. Auxiliary nuclear metals such as beryllium, zirconium, and metals for transfer of heat. Discussion of pertinent effects such as radiation damage and mass transfer. *Prerequisite*: Bachelor's degree in engineering, or special permission.

### 8-405. Principles of Specifications

Fall, 2 credits

BENJAMIN ROSENZWEIG

Principles underlying Government specifications systems. Survey of procurement documents and their purposes. Organization of specifications for form, clarity, and effectiveness. Evolution and ramifications of specifications with regard to research and development. Legal and contractual relations. Proprietary items. Government inspection. Division of specifications into performance and formulation types. Standardization and industry coordination. *Prerequisite*: Knowledge of procurement, inspection, research, and development processes, or specification writing.

### 8-682. Elements of Digital Data Processing

Fall, 3 credits. Repeated in Spring

DONALD F. MILESON and WILLIAM R. MURRAY

Basic theory and general principles of digital computing equipment. Binary, octal, and decimal numbering systems and conversions between systems. Binary arithmetic, truth tables, and concepts of Boolean algebra. Logical simplification. Mechanization of logic circuits. Memory and input-output devices. Timing and control, counters, registers, and the like. Fundamental computer design utilizing basic circuits. Principles of computer programming. *Prerequisites*: College algebra and basic electrical engineering courses, or special permission.

### 8-685. Engineering Applications of Digital Computers

Fall, 3 credits

JOHN R. BOSSENGA and ROBERT S. SMITH

Discussion of types of computing machinery available. Evolution of programming systems as pertaining to engineering applications. Feasibility testing and organization of problems for computer solution. Digital computer methods illustrated with examples taken from various fields of engineering. *Prerequisite*: Bachelor's degree in physical sciences, or comparable experience in field. No computing experience required.

### 8-375. Engineering Economics

Fall, 3 credits

MILTON F. SEARL

Comparison of economic merit of engineering alternatives. Methods applied in various industries and in Federal Government. Present worth, discounted cash flow, payout, and other techniques. Sunk, fixed, and incremental costs. Depreciation and equipment replacement studies. Income taxes in project analysis. Effect of uncertainty in cost and revenue projections.

### 8-406. Engineering Mathematics

Fall, 4 credits

ALAN O. PLAINT

For the student who has completed general college curriculum through calculus. Designed to provide the engineering student with awareness of other mathematical techniques useful for application to engineering problems. Also introduction to advanced topics for the student who wishes to go further. *Prerequisites*: Differential and integral calculus.



## 8-695. Engineering Reliability

Year, 2 credits each semester

H. WALTER PRICE

Designed for the engineer desiring to acquire comprehension of reliability concepts and to develop working knowledge of reliability techniques. Basic probability and statistics pertaining to reliability. Failure, survival, and failure rate functions. Exponential distribution. Weibull distribution. Gamma distribution. Evolutionary or response-surface techniques. Stress domains. Reliability effects of temperature, shock, vibration, humidity, and electrical stresses. System reliability. Probabilistic environmental-encounter and use-encounter analyses. Design parameter analysis. Design reliability. Specification reliability index analysis. Circuit reliability analysis. Reliability of parallel circuits. Mean-life of parallel elements. Probe test. Manufacturing reliability. Life-testing. Accelerated life-testing. Type B value engineering. Economic decision method. Maintainability. Optimum search techniques. Optimum module size. Availability. Logistics. Use of models and games to illustrate concepts. Solution of simulated reliability problems in class. Discussion of specific reliability problems submitted by students. *Prerequisite*: Degree in engineering, or special permission.

## 8-710. Steam Power Plants

Year, 3 credits each semester

FRANCIS W. BAUER and ASSOCIATES

Design and construction of modern-day steam power plant and associated operations. Maintenance and economic considerations. Emphasis on present and future power generation requirements. Unit design. Plant design. Fuels. Steam generators and auxiliary equipment and specific fuel applications. Piping design fabrication and layout. Water technology. Turbine generators and auxiliary and control equipment. Electrical systems and equipment including protection. Control and information handling systems, including data logging. Power plant auxiliary equipment such as condensers, heat exchangers, and pumps. Standards. Operations. Engineering supervision, inspection, and performance testing. *Prerequisites*: Engineering degree or equivalent experience, preferably including basic course in thermodynamics.

## 8-697. Highway Location and Design

Fall, 3 credits

FOREST H. GREEN

Basic principles of highway location, including recognition of topographic and cultural influences and application of road-use analyses. Use of airphoto interpretation methods, photogrammetry, and ground-reconnaissance surveys. Development of curvilinear alignments. Development and general application of geometric design standards, with special emphasis on freeway design. *Prerequisite*: Degree in civil engineering, or special permission.

## 8-698. Traffic Planning and Operations

Spring, 3 credits

FOREST H. GREEN

Urban traffic patterns. Traffic surveys and traffic volume predictions. Traffic assignment to proposed facilities and development of design volumes. Principles of traffic operations, including use of one-way streets, signals, and local improvements. Organization and operation of traffic engineering departments. *Prerequisite*: Degree in civil engineering, or special permission.

## Surveying and Mapping

COMMITTEE

G. C. Tewinkel, *Chairman*

D. A. Bucci, Walter Dix, Cecil Ellingwood, Randall D. Esten, George H. Everett, James P. Fondren, S. J. Friedman, Leon Kosofsky, E. S. Massie (Vice-chairman), W. R. Nunn, Jr., Rupert B. Southard, Jr.

The field of transportation, whether by land, sea, or air presupposes the existence of navigational charts based on accurate geodetic surveys. The planning and con-



struction of our public roads system, as well as pipe lines, transmission lines, and canals, are based on accurately prepared engineering plans. These depict the surface of the ground in three dimensions and contain all the surface and subsurface information that affects the economy of the operations. The reliability of charts and plans relates to probability, statistics, error analyses, and sampling to maintain the cost and accuracy of the plan in proper balance with the total cost of the facility.

Satellites offer a new method for geodesicists to determine the actual shape of the earth. Electronics offers new systems for distance measurement and new vistas of automation. Photogrammetry offers a modern tool for expediting topographic mapping. Cartography recognizes modern navigational needs by altering the appearance of its products to conform to new speeds, new instruments, and new vehicles. All these topics relate to applied physics and mathematics. A proper understanding of these ideas is important in the relationship of the specific function of a map-maker to the total field. The following curriculum is designed to assist the inquisitive map-maker in acquiring this understanding.

#### CERTIFIED STATEMENTS OF ACCOMPLISHMENT IN SURVEYING AND MAPPING

Certified Statements of Accomplishment in Surveying and Mapping are granted to the undergraduate and advanced student who complete organized courses of study intended to provide basic training for responsible work in surveying and mapping.

##### *Certified Statement of Accomplishment—Undergraduate*

The program leading to the Undergraduate Certified Statement of Accomplishment in Surveying and Mapping provides training approximately equivalent to that gained from a year of technical college work. Graduation from high school is the minimal educational background required, but some college work is desirable.

##### Requirements (30 credits)

1. Required prerequisite courses:

College algebra  
Trigonometry

2. 26 semester hours of credit with a grade of C or better in each of the following courses:

Applications of Mathematics to Surveying and Mapping (3)  
Cartography I (3)  
Elementary Surveying (3)  
Topographic Surveying (3)  
Photogrammetry I (3)  
Photogrammetry II (3)  
Aerial Photographic Interpretation (3)  
Map Projections and Grid Systems (3)  
Cartographic Techniques and Map Reproduction (2)

3. 4 semester hours of credit with a grade of C or better in courses selected from related electives listed under the Advanced Certified Statement of Accomplishment.

##### *Certified Statement of Accomplishment—Advanced*

The program leading to the Advanced Certified Statement of Accomplishment in Surveying and Mapping provides training at least at the level of the master's degree.

Although neither certified statement requires any specified work at the college level, the student is reminded that completion of courses in the broader and nontechnical subjects integral to the standard college curriculum is an important part of his general preparation for responsible work in this profession.

#### Requirements (30 credits)

##### 1. Required prerequisite courses:

College algebra  
Trigonometry  
Analytic geometry  
Calculus

##### 2. 21 semester hours of credit with a grade of B or better in each of the following courses:

Applied Cartography (2)  
Astronomy for Engineers (3)  
Geodetic Surveying (3)  
Computation and Adjustment of Geodetic Observations (3)  
Photogrammetry II (3)  
Photogrammetry III (3)  
Official Writing or Technical Writing (2)  
Editing Technical Manuscripts (2)

##### 3. 9 semester hours of credit with a grade of B or better selected from the following related electives, or 17 semester hours if both certified statements are received.

Advanced Aerial Photographic Interpretation (3)  
Applied Electronic Theory (6)  
General Geology (3)  
General Meteorology (3)  
General Oceanography (3)  
Historical Geology (3)  
Maps and Charts (2)  
Official Writing (Undergraduate only) (2)  
Route Surveying (3)  
Theory of Errors (3)

*Equivalent courses will be accepted by transfer from other colleges and universities. An applicant for either certified statement must file a transcript of his high school or college record before completion of his program.*

## Surveying

### 8-132. Introduction to Geodesy

Fall, 2 credits

INSTRUCTOR TO BE ANNOUNCED

Series of lectures designed to acquaint the student with many general topics involved in geodesy and the space age, with particular emphasis on modern thinking and methods. Use of mathematics minimized to fit capabilities of a particular class. Nevertheless, mathematical principles through trigonometry desirable and helpful. Topics include: Some elements of plane and spherical trigonometry. Figure of earth. Principles of motion and gravity. Triangulation, trilateration, geodetic leveling, gravimetry, astronomic observations, azimuth, and earth magnetism. Geodetic datums. Solar eclipses. Geodetic satellites. Some geometric problems encountered in lunar mapping, instruments, and methods.

**8-135. Elementary Surveying (1964-65 and alternate years)**

Fall, 3 credits

WILLIAM J. BLACKBURN, III

Use of transit, level, compass, and accessory equipment. Adjustment of instruments. Field methods of transit-and-tape traverse and engineers' leveling (differential and profile). Computations connected with above including adjustment of traverses by compass and transit rules. Computation of latitudes, departures, and areas. Lectures, classroom work, and field work. *Prerequisite:* Plane trigonometry.

**[8-204.] Ground Methods of Topographic Surveying (1965-66 and every third year)**

Spring, 3 credits

WILLIAM J. BLACKBURN, III

Stadia method. Mapping with transit. Plane table mapping. Plane table triangulation and special problems. Methods and practices in map construction. *Prerequisite:* Elementary Surveying.

**[8-215.] Route Surveying (1966-67 and every third year)**

Fall, 3 credits

WILLIAM J. BLACKBURN, III

Theory and practice of surveying for railroads, highways, and canals. Preliminary and location surveys, cross sections, earthwork quantities, and transition spirals. Lectures, classrooms, and field work. *Prerequisites:* Elementary Surveying and plane trigonometry.

**[8-217.] Astronomy for Engineers (1966-67 and every third year)**

Spring, 3 credits

WILLIAM J. BLACKBURN, III

Fundamentals of circular systems. Basis of determination of time, longitude, latitude, and azimuth. Use of instrumental equipment. *Prerequisite:* Elementary Surveying.

**8-218. Geodetic Surveying (1964-65 and every third year)**

Fall, 3 credits

WILLIAM J. BLACKBURN, III

Theory and practice of first- and second-order triangulation, traverse, and leveling. Use of baseline equipment, repeating and direction theodolites, and geodetic leveling equipment. Field computations necessary to insure accuracy of observations. *Prerequisite:* Elementary Surveying, or special permission.

**8-219. Computation and Adjustment of Geodetic Observations (1964-65 and every third year)**

Spring, 3 credits

WILLIAM J. BLACKBURN, III

Office procedures in final computation and adjustment of field observations introduced in Geodetic Surveying. Least square approach to adjustment of networks of traverse and leveling and simple triangulation figures. *Prerequisite:* Geodetic Surveying, or equivalent, or special permission.

## Photogrammetry

**8-120. Introduction to Photogrammetry**

Fall, 2 credits

RUPERT B. SOUTHARD, JR. and ROY R. MULLEN

Lectures and demonstrations in simple terms. General knowledge of photogrammetry: History, simple optics, fundamental photographic principles, types of aerial cameras, accessories, and photographic aircraft. Topographic mapping by photogrammetry, photointerpretation, geodetic control requirements for photogrammetry, extension techniques for control, and basic instrumentation for photogrammetry. Current developments and future aspects of photogrammetric science.



## 8-208. Aerial Photographic Interpretation

Fall, 3 credits

ETHAN D. CHURCHILL

Principles, techniques, and applications of aerial photographic interpretations. History, concepts, types of aerial photographs, principles, techniques, and applications. Study, and use in various fields, of aerial photographs as source of detailed natural and cultural information. *Prerequisite*: General background in one of the following—surveying and mapping, cartography, geography, geology, forestry, agriculture, architecture, or allied engineering fields.

## [8-408.] Advanced Aerial Photographic Interpretation (1965-66 and alternate years)

Spring, 3 credits

ETHAN D. CHURCHILL

Seminar on application of aerial photographic interpretation to specialized technical fields, such as forest, range, and wildlife management. Agricultural soil, engineering soil, and vegetation surveys. Geology and petroleum geology. Population census in rural and urban areas. *Prerequisite*: Basic training in aerial photographic interpretation. Training in forestry, range management, wildlife management, agriculture, ecology, geography, geology, or engineering desirable.

## 8-251. Photogrammetry I

Fall, 3 credits

RUPERT B. SOUTHARD, JR. and ROY R. MULLEN

Basic theory of photogrammetry. Elements of photogrammetric optics. Geometry of aerial photograph. Types, nomenclature, and capabilities of aerial cameras and accessories. Characteristics of photographic aircraft. Elements, instrumentation, and materials of photography. Scale considerations. Flight planning. Field surveys for photogrammetry. Radial-line methods for control extension and plotting. Stereoscopy and parallax, mosaics, and photointerpretation. *Prerequisites*: Applications of Mathematics to Surveying and Mapping, or equivalent.

## 8-252. Photogrammetry II

Spring, 3 credits

RUPERT B. SOUTHARD, JR. and ROY R. MULLEN

Continuation of basic photogrammetric theory and practice. Geometry of tilted photographs. Principles of stereophotogrammetry. Stereoscopic plotting instruments. Techniques for oblique photogrammetry. Photogrammetric control techniques. Compilation. Current developments in photogrammetry. Future trends. *Prerequisite*: Photogrammetry I.

## 8-480. Photogrammetry III

Fall, 3 credits

G. C. TEWINKEL

Advanced practical numerical details in form of applied analytic geometry. Graphic, semigraphic, and analytic methods for adjusting strips and blocks of aerotriangulation. Introduction to plane and solid analytic geometry, matrix algebra, and least square principles. Compensation for systematic errors of lens distortion, film distortion, atmospheric refraction, and earth curvature. Numerical relative orientation and numerical rectification. Introduction to application of electronic computers. Methods for exploiting full accuracy potential of photogrammetry. Course adjusted to meet professional interests of students. *Prerequisite*: Photogrammetry II.

## 3-508. Theory of Errors

(See P. 38)

## Cartography

## 8-125. Cartography I

Spring, 3 credits

WILLIAM A. FOSTER

General instruction in history of maps. Shape of earth. Fundamental concepts of common projections. Basic principles of plane and geodetic surveying. Topography. Hydrography. Photogrammetry. Oceanography. Classification, evaluation, compilation, construction, and revision of maps and charts. Methods and techniques of reproduction. Surveying with electronics.



## 2-114. Maps and Charts

(See P. 27)

## 8-240. Cartographic Techniques and Map Reproduction

Fall, 2 credits. Repeated in Spring

ANTHONY S. BASILE

Factors, commensurate with scale, to be considered before designing a chart or map for reproduction. Selection of reproduction process. Shaping of job for selected process. Reproduction support during the compilation stage. Types of line and half tone copy. Types of media used for line, half tone, and scribed originals. Color separations. Relief techniques. Reproduction techniques utilized in correcting chart/map to date. Cartographic typography. Photolithography, letter press, gravure, ozalid, and photogelatin processes, including historical background. Demonstrations of cartographic and reproduction techniques utilized by U. S. Naval Oceanographic Office, Coast and Geodetic Survey, Army Map Service, U. S. Geological Survey, and National Geographic Society, including historical background. Estimating man-hour costs. *Prerequisite*: Cartography I, or special permission.

## 8-226. Applications of Mathematics to Surveying and Mapping

Fall, 3 credits

CHARLES E. COOK

Designed to train the student in applying many principles of mathematics to surveying and photogrammetry. Access to desk calculator highly recommended because of exercises involved. Subjects: Distance and direction. Traverse and triangle computations. Geodetic and plane coordinates. Line slope and tangent formulas. Elementary application of solid analytic geometry and differential calculus. Spherical trigonometry. Least squares routine. Elementary matrix algebra operations. *Prerequisites*: College Algebra and Trigonometry.

## 8-223. Map Projections and Grid Systems

Spring, 2 credits

EDWARD W. FONFARA

Designed for cartographers and map research or intelligence specialists. Basic principles. Computations and layout methods. Definitions. Classifications. Characteristics. Identification methods. Coordinate systems in present day use, including rectangular, broad area, and true military grid. *Prerequisite*: Applications of Mathematics to Surveying and Mapping, or special permission.

## 8-426. Applied Cartography

Spring, 2 credits

ROBERT B. MERCREADY

Examination of cartographic principles of map projections, grid systems, symbolization, relief portrayal, statistical representation, and source materials according to requirements of United States Government mapping programs and those of selected foreign governments and private companies. Classroom projects and field trips to government and private cartographic installations. *Prerequisite*: Cartography I, or practical experience in mapping field.

## Fine and Applied Arts

## COMMITTEE

Rowland Lyon, *Chairman*

Sadye F. Adelson, Garnet W. Jex (Vice-chairman), George E. Muth

The courses offered in the fine and applied arts are of general interest.

*Fine Arts***8-320. Pencil Sketching and Water Color Painting**

Fall, 2 credits. Repeated in Spring and Summer

JAMES V. CUPOLI

Informal course in theory and practice of pencil sketching and ways and means of water color. Demonstrations in both media. The student may use either or both media.

**8-332. Introduction to Creative Expression**

Fall, 2 credits

DUANE A. MCKENNA

For the student without previous art training who seeks personal enrichment or pleasure of self-expression through drawing.

**8-321. Creative Expression from Life**

Spring, 2 credits

DUANE A. MCKENNA

Sketching for practical skill and pleasure using pencil and other media, according to needs of the student. Emphasis on action drawing from nature. Outside observations and field trips supplement work from model. Challenges basic, but practicing artist finds course valuable refresher.

**8-323. Portrait Painting in Oil**

Fall, 2 credits. Repeated in Spring

PIETRO LAZZARI

Professional methods of painting oil portraits incorporating basic techniques of old masters and spirit of modern art. Sketching, line composition, and light arrangement. Color, theory, and technique of painting in oil. All work from life. *Prerequisite*: Desire to do portrait painting. No experience required.

**8-338. Life Sketching**

Fall, 2 credits. Repeated in Spring

JAMES V. CUPOLI

Life and figure sketching of human figure. Painting of figure for the advanced student.

**8-357. Etching**

Fall, 2 credits. Repeated in Spring

EUGENE W. FREDERICK

Practice combined with lecture and demonstration to enable the student to produce his own prints in all phases of etching. Workshop to establish solid foundation to overcome technical problems. Emphasis on craft with time for free experimentation. No previous experience necessary, but knowledge of the drawing helpful. More advanced techniques for the student who repeats course.

**8-358. Etching Workshop**

Fall, 2 credits. Repeated in Spring

EUGENE J. FREDERICK

Practice in atmosphere of freedom in which experienced student makes use of learned techniques combined with experimentation. Possible creation of new directions in print-making field through exchange of ideas between student and instructor. *Prerequisite*: Two semesters of Etching, or equivalent.

**8-356. Oriental Painting**

Fall, 2 credits. Repeated in Spring

WOO SOUNG CHANG

Studies of flora, fauna, landscapes, and calligraphy in modern classical style of water color technique, using black stick ink and colors in rice paper. Appreciation and understanding of oriental art and philosophy.

## 8-333. Art Appreciation and Survey

Fall, 2 credits

FRANCES L. OSBORN

Designed for the beginning student. Against framework of development of painting, sculpture, and architecture from prehistoric to recent times, the student is given basic vocabulary, appreciation, and understanding of the fine arts.

## 8-334. Modern Art: Its Sources and Development

Spring, 2 credits

FRANCES L. OSBORN

To further the student's knowledge, appreciation, and understanding of his contemporary heritage.

## 8-336. History of Art in America

Summer, 2 credits

FRANCES L. OSBORN

Developmental survey of American painting and sculpture from seventeenth to twentieth century.

## 8-370. Music Appreciation

Fall, 2 credits

JOHN SHORTRIDGE

Designed to develop ability to enjoy music through study of musical styles, forms, and instruments of various periods. Consideration of changing role of music in society through the ages. Recordings and live performances.

## 8-359. Theater

Fall, 2 credits

DONALD J. WATERS

Designed to develop appreciation and judgment of all arts of theater to make theater-going more meaningful. Consideration of plays and playwrights from Greeks to now. Actors, directors, scenic artists, and critics. Introduction to great artists of theater. Lectures, reading of plays, critiques, and playgoing.

### *Applied Arts*

## 8-35. Introduction to Institutional Housekeeping

Fall, non-credit

EMMA MORGAN and ASSOCIATES

Introduction to fundamentals of institutional housekeeping for hotels, hospitals, motels, college dormitories, fraternity and sorority houses, and similar institutions. Basic principles of the work. Attractive to the woman planning another type of job when the younger generation is challenging her position. Field trips and demonstrations.

## 8-36. Institutional Housekeeping II

Spring, non-credit

EMMA MORGAN and ASSOCIATES

Further study of rapidly expanding field. Rules and practices of many varied duties of Executive Housekeeper. *Prerequisite:* Introduction to Institutional Housekeeping, or practical experience in a supervisory capacity.

## 8-55. Introduction to Interior Decoration

Fall, non-credit. Repeated in Spring

MARGARET A. STEININGER

Designed for those who wish nonprofessional knowledge of principles of design and color to help them with their home decorating problems. Design, color furniture arrangement, floor and wall coverings, textiles, accessories, lighting, and setting up of actual floor plans of rooms.



[8-144.] Graphic Arts in Federal Government (1965-66 and 1966-67. *Not offered 1967-68*)

Year, 2 credits each semester

MAURICE EYSENBERG and WILLIAM WILSON TAYLOR

Introductory survey of field of graphic arts in the Federal Government. For practicing artists, designers, and others concerned with preparation and use of visual materials in many media. Classroom lectures and demonstrations, discussion, and analysis of homework by staff and visiting experts.

8-322. Art, Layout, and Design for Reproduction (1964-65 *and every third year*)

Fall, 2 credits

DAVID M. GRANAHAH and WILLIAM WILSON TAYLOR

Planned to help administrators, editors, educators, graphic personnel, and writers to prepare and use communications materials more effectively.

8-145. Layout in Visual Communication (1964-65 *and every third year*)

Spring, 2 credits

MAURICE EYSENBERG

Layout as first step in visual communication, such as a chart, poster, slide, printed page, exhibit, and the like. Classroom discussion, demonstration, comparison, and analysis. Home assignments to practice and apply basic rules.

2-243. Using Visuals Effectively (See P. 26)

8-284. Landscape Design of Small Property

Fall, 2 credits

HENRY SCHULTHEIS

Introduction to fundamentals of landscape design. Emphasis on small properties of one-half to one acre. Principles of orientation, arrangement, and circulation, as related to topography, solar orientation, verdure, subgrade conditions, utilities, and prevailing winds.

8-285. Landscape Use of Trees, Shrubs, Vines, and Flowers

Spring, 2 credits

HENRY SCHULTHEIS

Continuation of Landscape Design of Small Property. Emphasis on principles and practices relating to execution of mass tree and shrub outlines. Types and characteristics of evergreens and deciduous trees, shrubs, and vines. Review of care and maintenance of tree and shrub plantings, lawns, and gardens. Seminar at Annual Flower Show in visual research of garden design and use of plant materials in three dimensions as well as color. A student may register for the second semester without the first.

## Photography and Lithography

### COMMITTEE

Edward S. Cobb, *Chairman*

Raymond Davis, Fred W. Gerretson, Julius Halsman, Joseph F. Hamm, R. J. Lefebvre, Keith B. Lewis, Albert R. Materazzi, Albert W. Matthews, Charles T. Meyers, Jr., F. M. Orsini, Howland Pike, Elbridge C. Purdy, Frank J. Scherschel

Advances in the use of light sensitive materials in the arts and sciences and in industry have caused demand for new and refresher training in the fields of photography and lithography. The development of the printing arts has similarly opened up new

areas of training. The following courses are intended to meet these and other related needs. The courses are designed to furnish basic technical information applicable to all areas. They also develop special skills for particular applications. Finally, they try to satisfy special requirements within the photographic and allied industries.

## 8-70. Popular Photography

Fall, non-credit. Repeated in Spring and Summer

NORMAN LEE McCULLOUGH

Nontechnical demonstration course. Designed for camera enthusiasts desiring to understand how their cameras, films, and prints work. Camera types and operation. Film types and uses. Developing and printing. Filters. Exposures. Planning, composition, and lighting. Portraiture. Motion pictures. Color photography. Exhibition and demonstration of equipment, materials, and techniques.

## 8-192. Fundamentals of Photography I

Fall, 2 credits. Repeated in Spring

EDWARD S. COBB

Principles of photography. Foundation for more advanced courses in photography. Nature of photographic process. Light as applied to photography. Development of chemicals. Factors in development. Judging exposure, lenses, and image formation. Effects of lighting subject. Shutter performance. Fixing and washing.

## 8-193. Practice of Photography I

Fall, 3 credits. Repeated in Spring

INSTRUCTOR TO BE ANNOUNCED

Laboratory practice and demonstration of principles taught in Fundamentals of Photography I. It offers the student opportunity to become familiar with recommended procedures and techniques. Contact printing and processing. Selection of printing papers. Processing of negative roll film, cut film, and film pack. Diagnosis and remedy of processing defects. Types of cameras, their operation and uses, and application of filters.

## 8-195. Fundamentals of Photography II

Spring, 2 credits

ALBERT R. MERRITT

Theory to obtain good negative by controlled exposure and development. Principles of projection printing. Proper selection and utilization of darkroom equipment. Quality control procedures in everyday photography. Photo-sensitive materials. Use of exposure meter. Functions of light filters. Types of lighting. Science of sensitometry to measure and control photographic process. *Prerequisites*: Fundamentals of Photography I and Practice of Photography I, or equivalent.

## 8-196. Practice of Photography II

Spring, 2 credits

HARRY L. BURNETT, JR.

Projection printing. Application of sensitometric measurements. Print correction. Composite printing. Use of variable contrast papers. Lighting. Rendition of form and texture. Light patterns. Effect of light on color, toning, and print quality analysis. *Prerequisites*: Fundamentals of Photography I, Practice of Photography I, and Fundamentals of Photography II. May be taken concurrently with Fundamentals of Photography II. *Each student must have access to outside laboratory facilities.*

## 8-360. Portrait Photography

Year, 2 credits each semester

ELBRIDGE C. PURDY

Studio and darkroom course with opportunity for practice. The student learns through individual guidance the subtleties of fine portrait work. Lighting, posing, composition, processing, and retouching. *Prerequisite*: Practice of Photography II.

## 8-270. Color Photography, Monopack Color Printing

Year, 3 credits each semester

OSCAR RODBELL

Basic theory and practice in making color prints on positive color "Printon" and color negative "Ektacolor" materials. Lectures: Basic theory, nature of color and light, three-color theory, formation of colors, additive and subtractive processes, color temperatures, and transmission and absorption of filters. Laboratory: Selection of equipment, evaluation of transparencies and color negatives, proper exposure controls, mixing of chemical solutions, controls in color processing, and practical application of these fundamentals. *Prerequisite*: Background in black and white photography and 4- $\times$  5-inch color negatives for practical application in laboratory, or special permission.

## 8-194. Creative Photography through Composition I

Fall, 2 credits

MARTIN H. MILLER

Practical help for beginner as well as experienced photographer. Intended to develop understanding of composition and design. Practice in applying to the photographs of the student elements of composition that make superior pictures. Criticism and suggestions on prints and color slides. Course applies to color slides, color prints, and black and white photographs. Discussion of original photographs by outstanding pictorial and photo-journalist photographers. Field trip.

## 8-197. Creative Photography through Composition II

Spring, 2 credits

MARTIN H. MILLER

Continuation of Creative Photography through Composition I. Practical help for the student to improve his pictures. Review of basic principles of composition and application to the work of the student. Course applies to color slides, color prints, and black and white photographs. How to see a picture. How to present subject matter in interesting fashion. Use of photographs as medium of communication. Night photography. Prize-winning pictures. Pictures for exhibition. Criticism and suggestions on prints and color slides and practice in analyzing and judging photographs. Several picture-taking field trips. A student may register for the second semester without the first.

## 8-198. Photo-journalism

Fall, 2 credits. Repeated in Spring

RUSSELL T. FORTE

Theory and practice, with "how-to" approach as means of communicating through photographs and words. Analysis of principles of taking and using photographs to tell story effectively. Working knowledge of photography desirable.

## 8-333. Art Appreciation and Survey (See P. 99)

## 8-334. Modern Art: Its Sources and Development (See P. 99)

## 8-336. History of Art in America (See P. 99)

## 8-011. Photographic Roundtable

Fall, non-credit. Repeated in Spring

EDWARD S. COBB

Opportunity for continued study of photography. The group meets twice each month during the regular school year. One meeting is devoted to constructive analysis of photographic work presented by members; the other meeting is devoted to presentation of information about new developments and techniques in photography and to other topics of current interest. Annual Salon. Open to the student who has completed any of the courses in photography offered by the Graduate School.



## 8-165. Copy Preparation—Pasteup

Fall, 3 credits. Repeated in Spring

W. HOWARD MARTIN

Designed to acquaint the student with fundamentals of good composition and layout, and application of these principles to paste-up of positives, using type from phototype setting equipment and the Fotosetter. Analysis of good and bad composition through study of advertisements, photographs, and illustrations. Instruction in use of drafting equipment and materials in preparation of advertisements, ruled forms, and simple and complex booklets, using photographs, illustrations, and color overlays.

## 8-166. Copy Preparation—Photographic

Fall, 3 credits. Repeated in Spring

ROBERT S. WRAY, JR.

Laboratory instruction and practice in fundamentals of basic photographic processes. Preparation of prints and negatives used in the paste-up class, photographing of completed assignments, and opaquing and engraving of final negatives. Stripping of halftone and line negatives, masking, surprinting, and register of negatives.

## 8-170. Survey of Lithography

Year, 3 credits each semester

DAVID REZNIKOFF

Primarily for the lithographic apprentice or those desiring understanding of whole lithographic process. First semester: Development of lithography. Other printing processes and their relationship to lithography. Offset photography, including color. Plate making. Layout and stripping. Second semester: Press work. Copy preparation. Cold and hot composition and photo typesetting. Lithographic ink making and uses. Offset papers, including visit to mill in Pennsylvania. Binding. Advantages and limitations of process. Future trends. Lectures and field trips.

## 8-171. Offset Stripping and Negative Work

Year, 3 credits each semester

JOSEPH F. HAMM

Workshop at apprentice level. Film assembly and stripping procedures and techniques as applied to black and white and simple color register work in photolithography. Survey of stripping. Tools for stripping and their use. Basic mathematics. Opaquing and retouching. Cutting and scribing lines. Negative engraving. Stripping inserts and corrections. Ruling pen practice. Masking halftones and tints. Silhouetting halftones. Quality control problems. Preparing the dummy. Making accurate layouts. Signature imposition. Attaching negatives to flats. Complimentary flats for double printing. Color proving for accurate check. Other stripping problems and procedures. *Prerequisite*: Survey of Lithography, or special permission.

## 8-174. Offset Photography

Year, 3 credits each semester

WILLIAM I. RANKIN

Workshop at apprentice level. Contact and camera line and halftone negatives for photolithography. Darkroom processing. Contact and mechanical screens. Filters and lens formulae. *Prerequisite*: Survey of Lithography, or equivalent.

## 8-175. Lithographic Estimating

Year, 2 credits each semester

PRIMO F. MOLINARI

Analysis and procedures of cost estimating, with emphasis on cost finding and its application to preparing estimates especially in Federal Government. Relationship of estimate to customer and plant. Materials, new products, their use, and how they can reduce costs. Selection of problems and writing up of practice estimates. First semester: Introduction to estimating, basic accounting principles, and development of budgeted hourly costs for a plant. Expenses and how to distribute them. Materials and their storage and handling, offset photography, platemaking, and paper, and its problems. Second semester: Copy preparation, composition, offset press work, and bindery operations. Field trips to both hot metal and cold composition plants, an ink plant, a bindery, and a paper mill. Guest lecturers from lithographic trade.

# Courses Offered at the Systems Research and Development Service, Federal Aviation Agency

## ADVISORY COMMITTEE

Carl M. Russell, *Chairman*

Albin N. Benson, Henry A. Budde, Hans Giesecke, Frank J. Griendling, H. V. Herman-  
sen, Robert K. McKelvey, Edward E. Wood

The Federal Aviation Agency invited the Graduate School to offer courses at its Systems Research and Development Service, Atlantic City, New Jersey, beginning in the spring 1961 semester. These courses are open to all employees of the Federal Government and to other qualified students as facilities permit.

## Languages and Literature

### 2-450. Technical Writing

Fall, 2 credits. Repeated in Spring

INSTRUCTOR TO BE ANNOUNCED

Designed to help engineers, technicians, mathematicians, and other technical personnel to improve their research reports. Survey of fundamentals of writing technical report. Its characteristics, parts, functions, as well as steps in preparation, and process of criticism.

## Mathematics and Statistics

### 3-107. Applied Mathematics I

Fall, 2 credits

ALBERT J. ZELINSKI

Designed to provide working knowledge of basic mathematics used in research and development work. To prepare for more sophisticated approaches and mathematical techniques. Review of algebra and trigonometry. Linear and nonlinear equations. Coordinate systems. Logarithms. Arithmetic and geometric progression. Emphasis on appropriate quantity and quality of applications. *Prerequisites*: High school algebra and trigonometry.

### 3-108. Applied Mathematics II

Spring, 2 credits

ALBERT J. ZELINSKI

Continuation of Applied Mathematics I. Determinants. Permutations and combinations. Probability. Infinite series. Elements of calculus. *Prerequisite*: Applied Mathematics I, or equivalent.

### 3-550. Introduction to Digital Computers

Year, 3 credits each semester

EDWARD A. ROBIN

Designed for the student with minimal background in engineering and mathematics. Broad view of relationships of computer to scientific investigation and business enterprise. Relationships between problem and computer. Examination of structure and organization of computer in connection with large functional units. Their interrelations, interdependence, and control. Some programming concepts.

### 3-765. Logical Design of Digital Computers

Year, 3 credits each semester

EDWARD A. ROBIN

Introduction to logical design of digital computer. Number systems and computer components. Boolean algebra and its use in logical design. Combination logic. Sequential or memory circuits. Flow tables and flow graphs. Memory element input equations. Synchronous versus asynchronous synthesis. Logic modules. *Prerequisites:* Working knowledge of algebra. Training at college level in engineering, physical sciences, or mathematics, or equivalent experience.

### 3-464. Digital Computer Programming

Year, 3 credits each semester

FREDRICK C. HOLLAND

What a computer is and how it is used. Flow diagramming. Programming IBM 7090 computer. Simple machine decisions. Introduction to magnetic tape input-output. Symbolic assembly program. Looping, indexing, and open and closed subroutines. Arithmetic operations. Floating-point representation of numbers. Program testing. *Prerequisite:* High school algebra, or acquaintance with digital computers.

### 3-383. Experimental Statistics

Fall, 3 credits

DONALD L. WESTERFIELD

Designed to provide the student with sufficient background and proficiency in statistical methodology to undertake advanced training in Experimental Design or equivalent course. Topics: Scientific method. Statistical analysis. Central tendency. Dispersion, Probability. Sampling. Testing statistical hypotheses. Statistical inference. Analysis of variance. *Prerequisite:* High school algebra.

### 3-384. Experimental Design

Spring, 3 credits

DONALD L. WESTERFIELD

Nonmathematical course in analysis and interpretation of experimental data. Elementary probability relationships. Common frequency distributions. Concept of sampling error. Tests of significance of differences between averages. Chi-square test as applied to differences between observed and expected frequencies. Regression and correlation. Elementary discussion of analysis of variance and covariance. Basic design principles of experimentation, including randomized blocks, Latin square, incomplete blocks, factorials, and confounding. Laboratory exercises based on typical experimental and evaluation problems encountered at Systems Research and Development Service.

## Social Sciences

### 7-225. Human Engineering

Fall, 3 credits

LEE E. PAUL

Experimental methods as applied to problems of visual and auditory presentation of information, work and fatigue, job analysis, man machine allocation of functions, and other areas of interest to psychologists and engineers in research and development. Emphasis on engineering as exhibited in research and development programs at Systems Research and Development Service.



# Correspondence Program

Manlio F. De Angelis, *Chairman*

Mary L. Collings, James E. Herby, E. J. Peterson, Charles B. Rauscher, George T. Reeves, Jr., John W. Scott, James H. Starkey

The following courses are open to qualified field employees of the departments and agencies of the Federal Government and to other qualified students as facilities permit. For additional information and for registration materials, write to the Registrar, Graduate School, U.S. Department of Agriculture, Washington, D. C. 20250

## 10C. Review of Engineering Fundamentals for P. E. Examination

Non-credit (16 lessons)

JOHN H. RIXSE, JR.

General refresher course in basic sciences and engineering principles. Intended to assist in preparation for basic portions of the Professional Engineer's License Examination (Engineers-in-Training). Not specific branches of engineering, but introductory problems for specific branches. Elements of strength of materials. Structures. Fluid mechanics. Mechanical engineering. Electrical engineering. Engineering economics. *Prerequisite:* Preferred, those qualified to take the Professional Engineer's Examination. Cost: \$42 and \$10 for supplies and postage. Text materials are extra.

## 120C. Basic Electricity

2 credits (16 lessons)

JAMES B. MCCURLEY

For nontechnical and beginning technical personnel. Essentials of basic electrical theory: Electrostatics. Electromagnetics. Resistance. Inductance. Capacitance. Direct and alternating current circuits. Transformers. Generators. Motors. Polyphase systems and connections. Rectifiers. Essentials of electric wiring. Use of elementary mathematics only with explanations as needed. No previous knowledge of electricity required. Cost: \$28 and \$10 for supplies and postage. Text materials are extra.

## 125C. Basic Lettering

1 credit (7 lessons)

EUGENE MAY

Designed to familiarize the student with the fundamentals of lettering with applications to soil survey charts and maps. Basic strokes, spacing, use of contour pen, and lettering of symbols on aerial photographs. Cost: \$14 and \$6 for supplies and postage. (This does not include the lettering tools.)

## 130C. Plain Letter Writing

Non-credit (6 lessons)

ELIZABETH D. SECREST

Modern government letter writing techniques by 4-S formula for Shortness, Simplicity, Strength, and Sincerity. Adaptation of "Plain Letters Workshop." Supplemental reading and work assignments. Designed for employees of the Federal Government without access to "Plain Letters Workshop." Emphasis on skills of communication rather than on grammar. Cost: \$14 and \$6 for supplies and postage.

## 114C. Federal Personnel Procedure

2 credits (16 lessons)

HENRY C. STARNES

Legal, regulatory, and procedural aspects of Federal personnel administration. Designed to broaden technical knowledge of those engaged in personnel work and to inform those in other administrative activities about personnel requirements and activities. Also to acquaint the Federal employee in general concerning laws and regulations governing his status and rights. Study of purpose and place of personnel activities in the Government. Review of basic laws and authorities for personnel action, position classification activities, recruiting, and administrative activities preceding appointment process. Requirements and procedures involved in personnel actions such as appointments, promotions, removals, retirements, reductions in force, and disciplinary actions. Personnel activities involving minimum of standard regulation, procedure and practice, such as training, incentive awards, employee relations, and employee performance. Cost: \$28 and \$10 for supplies and postage. Text materials are extra.

## 205C. Modern Supervisory Practice

2 credits (16 lessons)

WILLIAM R. VAN DERSAL  
NORMAN A. BERG  
JOSEPH B. ROGERS

Designed for supervisors or those desiring to become supervisors. Involves study and application of principles of supervision, supervisory techniques, participation, motivation, communications, organization principles, workload analysis, planning, scheduling, work improvement studies, and solving problem cases. Cost: \$28 and \$10 for supplies and postage. The text is extra.

## 236C. Report Writing

2 credits (15 lessons)

ROBERT C. REED  
WILBERT SCHAAL

Designed to assist field employees of the Federal Government in preparing memoranda and reports. Simple and brief treatment of English composition. Special attention to clear, concise, orderly, and informative presentation. Avoidance of more common faults of expression. Cost: \$28 and \$10 for supplies and postage. The text is extra.

## 500C. Technical Writing

2 credits (16 lessons)

WARD W. KONKLE

Designed to help scientists, engineers, and economists improve their research reports and journal articles for professional publication. Step-by-step procedure in planning, outlining, and writing first draft. Revising for clarity. Adding professional touch. Presenting data in tabular form. Writing summaries and abstracts. Reviewing and evaluating technical papers. *Prerequisite*: Undergraduate degree in one of sciences, engineering, economics, or other technical field. Cost: \$28 and \$10 for supplies.

## 316C. Soils and Soil Management

2 credits (15 lessons)

J. GORDON STEELE

Practical aspects of soil management. Physical, chemical, and biological properties of soils. How soils are formed. Soils of different places. How soils are changed by erosion, depletion, and improvement. Management of soils for good production and for their conservation and improvement. *Prerequisite*: High school chemistry, or equivalent. Extra reading necessary for the student without high school chemistry. Physics desirable, but not required. Cost: \$28 and \$10 for supplies and postage. The text is extra.

## 325C. Legal Aspects of Investigations—Criminal Evidence and Procedure

JOSEPH D. CUMMINGS

Designed to provide investigative personnel and those desiring to prepare for such work background and insight into legal aspects of crime investigations. Procedures concerning admission of evidence. Circumstances and conditions under which evidence is of probative value. Crimes and

their elements. Court procedures. Because all investigations are potential sources of prosecution, the requirements of criminal evidence and procedure often reach into the early stages of investigation. Designed to provide understandable information without overemphasis on technical aspects. Cost: \$28 and \$10 for supplies and postage.

## 362C. Federal Meat Inspection and Animal Quarantine Laws

2 credits (16 lessons)

DONA S. KAHN

History, constitutionality, and provisions of the Federal Meat Inspection Act and related legislation, the Animal Quarantine statutes, and the Poultry Products Inspection Act. The course is intended as an aid to administrative officials. No previous legal training is required. Cost: \$28 and \$10 for supplies and postage.

## 410C. Safety Program Administration

2 credits (16 lessons)

SETH JACKSON

Practical course aimed to help supervisors and staff at all levels with their accident prevention problems. History and principles of accident prevention. Basic needs of a safety man. How to appraise training needs and maintain interest in safety efforts. Fundamentals of an effective safety program and some "sure-fire" formulas successfully used in industry and Government. Emphasis on prevention through human relations rather than on investigation of accidents. Cost: \$28 and \$10 for supplies. Text materials are extra.

## 513C. Statistical Methods in Biology and Agriculture

2 credits (15 lessons)

E. L. LE CLERG

Simple variation. Regression and correlation. Analysis of variance and covariance. Chi-square. Multiple and curvilinear correlation. Application to sampling and experimental design. Practical application of methods. *Prerequisite*: Facility in use of arithmetic and understanding of algebra. Cost: \$28 and \$10 for supplies and postage. The text is extra.

## 515C. Statistics of Biological Assay

1 or 2 credits (6 or 16 lessons)

F. M. WADLEY

Introduction to specialized methods that have been developed for both graded and all-or-none responses. Estimates of potency, comparisons of materials, variances, and other phases. *Prerequisite*: Facility in regression study and analysis of variance, such as taught in Statistical Methods in Biology and Agriculture. Cost: \$14 or \$28 and \$6.00 or \$10 for supplies and postage.

## 521C. Experimental Design

2 credits (16 lessons)

F. M. WADLEY

Basic concepts, practice in applying them, and acquaintance with literature opening the way to further study. Philosophy and fundamentals, with some attention to elementary sampling principles. Simpler practical designs, use and analysis of results. Factorial design, confounding, and more complex experiments including incomplete block designs. *Prerequisite*: Genuine practical interest in experimentation and some facility in statistical calculations, including analysis of variance. Cost: \$28 and \$10 for supplies. The text is extra.

## 533C. Hydrology I

3 credits (16 lessons)

DONALD R. BAKER

Review of elementary hydraulic principles basic to study of flow in natural channels. Phenomena of meteorology that control climate. Methods of collecting data essential to hydrology. Physical characteristics of the land that control the disposition and movement of the earth's water. *Prerequisites*: Physics and algebra. Elementary meteorology, statistics, and engineering desirable, but not required. Cost: \$42 and \$10 for supplies and postage. The text is extra.



## 534C. Hydrology II

3 credits (16 lessons)

DONALD R. BAKER

Tools used by the hydrologist and application of these tools to specific problems. Hydrograph analysis, runoff relations, runoff distribution, waves, and streamflow routing. Special techniques required in design of projects. Design and operation of water control works. Small basin problems. River forecasting. *Prerequisite:* Hydrology I, or equivalent. Cost: \$42 and \$10 for supplies and postage. The text used in Hydrology I is also used in this course.

## 580C. History of American Agriculture

3 credits (16 lessons)

WAYNE D. RASMUSSEN

Development of American agriculture from colonial settlement to the present, treated on a chronological basis. Designed to give an historical background for understanding present-day agricultural problems. Two major technological revolutions in American agriculture. Department of Agriculture. Land Grant Colleges. Application of science and technology to farming. Government policies affecting agriculture. Cost: \$42 and \$10 for supplies and postage. The text is extra.

## Special Program in Meteorology

The following is a special in-service training program in meteorological analysis and prediction offered in cooperation with the United States Weather Bureau. The program is under the general direction of Albert V. Carlin, Chief of Training, United States Weather Bureau, Department of Commerce.

## 535C. Modern Methods of Meteorological Analysis and Prediction

4 credits (8 lessons)

JAY S. WINSTON and ASSOCIATES

Advanced course designed to provide the practicing field meteorologist with better understanding of some of the techniques and concepts important in present-day forecasting. Hemispheric synoptic map analysis. Predicting motion and development of waves in the westerlies. Numerical weather prediction. Large scale-vertical motion and divergence. Isentropic analysis. Jet stream. Statistical prediction methods. Forecasting tornadoes and severe thunderstorms. Reading assignments covering each of these topics from recent articles and books. Extensive laboratory exercise as part of each lesson, illustrating the particular topic by practical analysis of, or computation from, typical synoptic cases. *Prerequisites:* Basic knowledge of synoptic and dynamic meteorology and weather forecasting.

## 540C. Extended-Range Forecasting

3 credits (5 lessons)

JAY S. WINSTON and ASSOCIATES

Advanced course intended to familiarize the practicing field meteorologist with behavior of atmospheric circulation and weather over longer periods and with methods employed by the Extended Forecast Section of the Weather Bureau to predict circulation and weather for periods of five and 30 days. Laboratory exercises illustrating long period development and application of forecasting methods to specific cases. *Prerequisite:* Modern Methods of Meteorological Analysis and Prediction, or equivalent.

## Special Program in REA Accounting

Three correspondence courses designed for Borrowers' personnel of the Rural Electrification Administration are available. The basic accounting course is also suitable for students other than REA personnel who want to learn the elementary principles of accounting.

## 100C. Basic Accounting

Non-credit (12 lessons)

HOWARD C. PAINE, JOHN W. SCOTT, and ASSOCIATES

Introduction to accounting for those who have need of some knowledge of accounting, as taxpayers, as employees having certain accounting duties, as managers or directors of a business, or as students embarking on a program of studies including ultimately more specialized accounting. Basic definitions and principles through journalizing, posting, general and subsidiary records, adjustments and accruals, and depreciation to financial statements and ratios, and closing of the books. Thorough grounding in basic accounting theory and its practical application. Cost: \$28 and \$10 for supplies and postage.

## 200C. REA Borrower Accounting (Electric)

Non-credit (12 lessons)

JOHN W. SCOTT and ASSOCIATES

Designed primarily to train those who are now, or intend to be, office managers, accountants, or bookkeepers in offices of electric utility cooperatives financed by the Rural Electrification Administration. Also useful for employees and directors and managers of REA-financed cooperatives and certified public accountants, attorneys, and engineers engaged by them. Discussion of accounts and accounting records used through construction accounting procedure. Methods of opening, maintaining, and closing books. Financial and statistical reports and their analysis. Technical aspects of REA electric-borrower accounting. Continuing property records. Budgeting. Requesting, accounting for, and repaying REA loan funds. Working knowledge of accounting basic to electric utility industry. Unique accounting requirements arising from method of financing REA borrowers and nonprofit nature of those borrowers organized as cooperatives. Revised to include system of accounts as of January 1961. The Administrator of the Rural Electrification Administration awards a Certificate of Proficiency to the student who satisfactorily completes the course. *Prerequisite*: Basic Accounting, or equivalent, or one year of experience in an REA borrower's office as bookkeeper or assistant bookkeeper. Cost: \$42 and \$10 for supplies and postage.

## 300C. REA Borrower Accounting (Telephone)

Non-credit (12 lessons)

HOWARD C. PAINE and ASSOCIATES

Designed to provide training for present or prospective bookkeepers and accountants employed by telephone utilities that are borrowers from the Rural Electrification Administration. Also to provide information on telephone utility accounting to directors, managers, and others concerned with the activities of these borrowers. Recommended books of account and basic accounting systems applicable generally to the telephone industry. Accounting to be performed during the periods of organization, construction, and operations. Requesting and accounting for REA loan funds. Computation of interest on, and repayment of, REA loan obligations. Recommended plant accounting procedures through construction and retirement work order procedures. Through successful completion of this course, the student should acquire overall understanding of accounting systems applicable to the telephone industry and working knowledge of specific procedures unique to telephone utilities financed by REA. The Administrator of the Rural Electrification Administration awards a Certificate of Proficiency to the student who satisfactorily completes the course. *Prerequisite*: Basic Accounting, or equivalent, or one year's experience as bookkeeper or assistant bookkeeper in the office of a telephone company or cooperative. Cost: \$42 and \$10 for supplies and postage.

# Faculty

## FACULTY, DEPARTMENTAL, AND SPECIAL COMMITTEES

The year following the name represents the first year of association with the Graduate School

- ABEL, MARTIN E., (1962). Ph.D., Minnesota. Analytical Statistician, Economic and Statistical Analysis Division, Economic Research Service, USDA. Taught at Minnesota. (Mathematics and Statistics)
- ABERNATHY, FRANK R., (1963). Contract Specialist, Procurement and Contract Management Division, Office of Plant and Operations, USDA. (Public Administration)
- ABRAHAMSEN, MARTIN A., (1963). Ph.D., Wisconsin. Deputy Administrator, Farmer Cooperative Service, USDA. Taught at North Carolina State and West Virginia. (Social Sciences)
- ACKER, LAURENCE W., (1948). Tyler Commercial College. Deputy Comptroller for Accounting and Finance, Office of Assistant Secretary of Defense (Compt.). C.P.A. Taught at American and Columbus School of Accounting. (Public Administration)
- ADELSON, SADYE F., (1949). M.A., California. Chief, Food Consumption Branch, Consumer and Food Economics Research Division, Agricultural Research Service, USDA. (Technology)
- ADOFF, JOAN G., (1963). B.A., Hunter. Systems Engineer, International Business Machines. (Mathematics and Statistics)
- ALEXANDER, BENJAMIN H., (1961). Ph.D., Georgetown. Research Chemist, Department of Immunochimistry, Walter Reed Army Institute of Research, Walter Reed Army Medical Center. Taught at American and Kobe (Japan). (Physical Sciences)
- ALLIN, BUSHROD W., (1939). Ph.D., Wisconsin. Chairman, Outlook and Situation Board, Economic Research Service, USDA. Taught at Wisconsin. (Social Sciences)
- ALLISON, LOWELL E., (1959). Ph.D., Illinois. Research Soil Scientist, U. S. Salinity Laboratory, Agricultural Research Service, USDA. (Biological Sciences)
- ANDERSON, ROBERT B., (1963). LL.B., Harvard. Attorney, Southern Railway System. Taught at American and Emerson. (Languages and Literature)
- APPLEMAN, PAUL L., (1946). Occupational Specialist, Bureau of Programs and Standards, Civil Service Commission. (Public Administration)
- ARASTEH, REZA, (1963). Ph.D., Louisiana State. Author and Counselor. Taught at Princeton and Tehran. (Languages and Literature and Social Sciences)
- ARMBRECHT, BERNARD H., (1962). Ph.D., Georgetown. Research Biochemist, Division of Pharmacology, Food and Drug Administration, Department of Health, Education, and Welfare. (Physical Sciences)
- ARMSTRONG, ROBERT H., (1963). Instructor, International Business Machines. (Mathematics and Statistics)
- ARMSTRONG, WILLIAM J., (1963). Chief, Office of Financial Management, Bureau of the Budget. (Public Administration)
- ARNOLD, OLGA MOORE, (1954). B.A., Wyoming. Information Specialist, U. S. Information Agency. (Languages and Literature)
- ARNY, SAMUEL A., (1961). M.S., Tulane. Biological Oceanographer, Biology Section, U. S. Naval Oceanographic Office, Department of the Navy. Taught at Louisiana State and Tulane. (Physical Sciences)
- ASKEGAARD, DAVID, (1950). B.S., North Dakota. Chief, Program Analysis Branch, Rural Electrification Administration, USDA. (Technology)
- AUSTIN, CHARLES J., (1963). B.S., Xavier (Cincinnati, Ohio). Chief, Data Processing Division, National Library of Medicine, Public Health Service, Department of Health, Education, and Welfare. (Mathematics and Statistics)
- BACH, VICTOR E., (1963). M.A., Yale. Senior Associate Mathematician, International Business Machines. Taught at Bard and Yale. (Mathematics and Statistics)
- BACHMAN, KENNETH L., (1950). Ph.D., Harvard. Director, Development and Trade Analysis Division, Economic Research Service, USDA. (Social Sciences)
- BAHN, CATHERINE I., (1953). M.A., Columbia. Head, Acquisitions Section, Map Division, Library of Congress. (Languages and Literature)
- BAILEY, S. O., (1960). M.S., Iowa State. Electronic Engineer (Instrumentation) Naval Research Laboratory, Department of the Navy. Taught at West Virginia. (Physical Sciences)
- BAKER, DONALD R., (1958). B.S., Kansas. Assistant Chief, Hydrologic Investigations Section, U. S. Weather Bureau, Department of Commerce. (Correspondence)
- BAKER, GLADYS L., (1945). Ph.D., Chicago. Agricultural Historian, Economic Research Service, USDA. (Public Administration)
- BALDAUF, TONY M., (1951). Assistant Director, Procurement and Property Management, Office of Plant and Operations, USDA. (Office Techniques and Public Administration)
- BALLARD, J. VERNON, (1961). B.S., Georgetown, C.P.A. Chief, Branch of Welfare and Pension Plans, Division of Compliance Operations, Office of Labor-Management and Welfare-Pension Reports, Department of Labor. (Public Administration)
- BAMFORD, RONALD, (1949). Ph.D., Columbia. Dean, Graduate School, University of Maryland. (Biological Sciences)
- BANKO, WINSTON E., (1962). B.S. Oregon State. Division of Birds, Smithsonian Institution. (Biological Sciences)
- BARGIN, GERMAINE, (1953). Diplômée Université de Paris and de l'Institut d'Amerique Latine de Mexico. Taught at Catholic, Georgetown, and Yucatan. (Languages and Literature)
- BARKER, H. KENNETH, (1961). Ph.D., Michigan. Associate Executive Secretary, American Association of Colleges for Teacher Education. (Committee on Academic Excellence)
- BARLOW, SHIRLEY, (1959). B.A., George Washington. Personnel Specialist, Personnel Management Branch, Federal Extension Service, USDA. (Office Techniques)
- BARNES, JOHN M., (1963). Ph.D., Cornell. Staff Plant Pathologist, Bioengineering Department, Hazleton Laboratories. Taught at Cornell. (Biological Sciences)
- BARTLETT, RICHARD P., JR., (1957). M.S., Virginia. Polytechnic Institute. Statistician, Agricultural Marketing Service, USDA. (Mathematics and Statistics)
- BASILE, ANTHONY S., (1961). B.C.E., George Washington. Head, Construction Branch, U. S. Naval Oceanographic Office, Department of the Navy. (Technology)
- BATCHELDER, ESTHER L., (1960). Ph.D., Columbia. Director, Clothing and Housing Research Division, Agricultural Research Service, USDA. Taught at Arizona, Columbia, Rhode Island, and Washington State. (Agricultural Research Center Committee)
- BAUER, CARL F., (1955). B.A., St. John's. Lecturer, School of Nursing Education, Catholic University, Maryknoll Seminary, and Maryknoll Teachers College, Ossining, New York. (Social Sciences)
- BAUER, FRANCIS W., (1964). B.S., Redlands. Supervisory Engineer, Bechtel Corporation. (Technology)
- BAUER, MAGNA E., (1942). Rome, Italy, and Auguste Victoria Lyzeum, Berlin. Historian, Office of the Chief of Military History, Department of the Army. (Languages and Literature)
- BAYEN, WALTER F., (1963). M.A., New York. Program Officer, Business and Government Services, Business and Defense Services Administration, Department of Commerce. Taught at American and George Washington. (Special Program)



- BEACHAM, LOWRIE M., (1950). B.S., South Carolina. Director, Division of Food Standards and Additives, Food and Drug Administration, Department of Health, Education, and Welfare. Taught at South Carolina. (Physical Sciences)
- BEAR, N. ROBERT, (1948). B.S., Ohio State. Chief, Division of Employee Appeals, Office of Personnel, USDA. Taught at Michigan State and Ohio State. (Public Administration)
- BEARDEN, GARY D., (1964). M.S., Texas Agricultural and Mechanical College. Head, Mathematical and Survey Applications Section, Washington Data Processing Center, Statistical Reporting Service, USDA. Taught at Texas Technological and U. S. Air Force Statistical Services Officer School. (Mathematics and Statistics)
- BEATY, LAYNE R., (1957). Chief, Radio and Television Service, Office of Information, USDA. (Committee on Information)
- BELL, E. DONALD, (1951). Assistant to Director of Labor Relations, Southern Railway System. (Office Techniques)
- BERG, NORMAN A., (1962). M.P.A., Harvard. Assistant to the Administrator, Soil Conservation Service, USDA. (Office Techniques and Correspondence)
- BLACKBURN, WILLIAM J., III, (1963). B.C.E., Ohio State. Geodesist, U. S. Coast and Geodetic Survey, Department of Commerce. Taught at Ohio State. (Technology)
- BLAIR, KATHERINE K., (1963). B.S., Salem (Massachusetts) State Teachers College. Taught at Alexandria (Virginia) Public Schools. (Office Techniques)
- BLOOM, RICHARD, (1964). Ph.D., Michigan. Social Science Research Analyst, Children's Bureau, Department of Health, Education, and Welfare. (Social Sciences)
- BOLDVREFF, TATIANA W., (1962). M.S. in L.S., Catholic. M.A. (Languages) Battle Creek. Translator, Naval Medical School, National Naval Medical Center, Department of the Navy. Taught at Battle Creek and Pennsylvania College for Women. (Languages and Literature)
- BOLLO, LOUISE ESPEY, (1952). B.A., George Washington. Nosologist, Public Health Service, Department of Health, Education, and Welfare. (Biological Sciences)
- BONDI, VICTOR L., (1961). Rome Law School. Professor of Italian, Defense Language Institute, East Coast Branch, Department of Defense. Taught at U. S. Naval Intelligence School. (Languages and Literature)
- BOSSENGA, JOHN R., (1964). M.S., Northwestern. Operations Analyst, Research Analysis Corporation. Taught at Northwestern. (Technology)
- BOULGER, JOHN R., (1964). Ph.D., Minnesota. Senior Consultant, Division of Research, Peace Corps, Department of State. Taught at Minnesota and Central Venezuela. (Social Sciences)
- BOUNDS, LESTER B., (1964). Corcoran. Designer-Visual Information Specialist, Arts and Graphics Division, USDA. Teacher of Art. (Languages and Literature)
- BOYD, LUCILE N., (1954). Employee Development Officer, Internal Revenue Service, Department of the Treasury. (Office Techniques)
- BREIMYER, HAROLD F., (1956). Ph.D., American. Staff Economist, Agricultural Marketing Service, USDA. (Social Sciences)
- BRETT, CARLTON E., (1961). M.A., Middlebury. Technical Editor, Technical Services Division, U. S. Naval Engineering Experiment Station, Annapolis, Maryland. Taught at George Washington. (Languages and Literature)
- BREWSTER, JOHN M., (1949). Ph.D., Columbia. Agricultural Economist, Economic Research Service, USDA. Taught at Columbia. (Social Sciences)
- BRIGGS, SHIRLEY A., (1962). M.A., State University of Iowa. Vice President for Publications and Editor, Audubon Naturalist Society of the Central Atlantic States, Inc. Taught at North Dakota State. (Biological Sciences)
- BROWN, PHILIP, (1956). B.A., Niagara. Director, Information, Farmers Home Administration, USDA. (Committee on Information)
- BUBECK, A. ERIC, (1962). M.A., Pennsylvania. Senior Staff, The Brookings Institution. Taught at Muhlenberg. (Special Program)
- BUCCI, D. A., (1959). B.S.E., George Washington. Assistant Chief, Department of Cartography, Army Map Service, Department of the Army. (Technology)
- BUCHANAN, LEE K., (1962). M.D., Iowa. Health, Safety, and Welfare, Office of Personnel, USDA. (Social Sciences)
- BUCK, LEWIS A., (1961). M.A., William and Mary. Director of Field School Studies, Audubon Naturalist Society of the Central Atlantic States, Inc. (Biological Sciences)
- BUCKLEY, JOHN L., (1961). Ph.D., State College of Forestry, University of New York. Director, Patuxent Wildlife Research Center, Bureau of Sport Fisheries and Wildlife, Department of the Interior. Taught at Alaska. (Biological Sciences)
- BUDDE, HENRY A., (1961). B.S., North Texas State College. Chief, Employee Services and Development Section, Systems Research and Development Service, Federal Aviation Agency. Taught at Amarillo (Texas) Public Schools. (FAA)
- BURKHART, M. D., (1955). M.S., Pennsylvania State. Physical Oceanographer, Evaluations Branch Head, U. S. Naval Oceanographic Office, Department of the Navy. (Physical Sciences)
- BURNETT, HARRY L., JR., (1956). In charge of Photographic Services, Office of Architect of the Capitol. (Technology)
- BURNS, ROBERT E., (1962). Ph.D., Washington, Oceanographer, Research and Development, U. S. Coast and Geodetic Survey, Department of Commerce. Taught at Bucknell and Washington. (Physical Sciences)
- BUTLER, FRANCES A., (1952). Director of Secretarial School, Emerson Institute. Taught at Temple Secretarial School. (Office Techniques)
- BUTLER, K. A., (1949). B.S., Minnesota. Program Director, Office of Inspector General, USDA. (Public Administration)
- BUTLER, REX G., (1964). M.A., Kansas State. Agricultural Statistician, Agricultural Price Statistics Branch, Statistical Reporting Service, USDA. Taught at Baker. (Mathematics and Statistics)
- CAMPAGNA, JOSEPH F., (1964). B.A., William and Mary. Automatic Data Processing Planning Officer, Office of Management and Organization, Department of Commerce. Taught at American. (Mathematics and Statistics)
- CAMPBELL, WILLIAM J., (1961). Ph.D., Ohio State. Chief, Department of Biological Chemistry, Walter Reed Army Institute of Research, Walter Reed Army Medical Center. Taught at American. (Physical Sciences)
- CANADA, THOMAS C., (1962). B.C.S., Benjamin Franklin. Assistant Chief, Division of Accounting Policies and Systems, Office of the Secretary, USDA. (Public Administration)
- CARLETON, WALTER M., (1961). Ph.D., Michigan State. Associate Director, Agricultural Engineering Research Division, Agricultural Research Service, USDA. Taught at Iowa State, Kansas State, and Michigan State. (Technology)
- CARLIN, ALBERT V., (1951). B.S., Boston. Chief of Training Section, U. S. Weather Bureau, Department of Commerce. (Physical Sciences and Correspondence)
- CARLSON, THEODORA E., (1952). B.A., Nebraska. Chief Periodicals Section, Office of Education, Department of Health, Education, and Welfare. (Committee on Publications)
- CARROLL, ELIZABETH T., (1962). USDA-FAS-Barter and Stockpiling. (Office Techniques)
- CARTER, PAUL S., (1955). M.B.A., Northwestern. C.P.A. Assistant Director, Accounting and Finance Policy, Office of Secretary of Defense, Department of Defense. (Public Administration)
- CARTER, ROY A., (1963). B.M. in E., Howard. Technical Writer, Research and Development, Federal Government. (Languages and Literature)
- CAVIN, JAMES P., (1938). Ph.D., Harvard. Director, Economic and Statistical Analysis Division, Economic Research Service, USDA. Taught at Catholic and Puerto Rico. (Social Sciences)
- CERINE, WILHELMINA M., (1957). B.S., Teachers College (Columbia). Employee Development Officer, Department of Labor. Taught at Naval Research Laboratory and Public Schools, New Jersey and Pennsylvania. (Office Techniques)
- CHANG, WOO SOUNG, (1964). Yasawa Fine Arts Academy (Korea). Artist and Historian of Oriental Painting. Taught at Seoul. (Technology)

- CHOU, KYONG CHOL, (1964). Ph.D., Pennsylvania. Astronomer, U. S. Naval Observatory, Department of the Navy. Taught at Korean Military Academy and Tusculum. (Physical Sciences)
- CHRISTENSEN, RAYMOND P., (1959). Ph.D., Wisconsin. Agricultural Economist, Deputy Director, Development and Trade Analysis Division, Economic Research Service, USDA. (Social Sciences)
- CHURCHILL, ETHAN D., (1950). Ph.D., Catholic. Botanist, U. S. Geological Survey, Department of the Interior. Lecturer in Ecology, Catholic University. (Technology)
- CLARK, EARL F., (1962). B.E.E., Minnesota. Electrical Engineer—General, Power Plant Branch, Rural Electrification Administration, USDA. (Mathematics and Statistics)
- CLAWSON, MARION, (1962). Ph.D., Harvard. Director, Land Use and Management Program, Resources for the Future, Inc. (Social Sciences)
- CLEWLOW, CARL W., (1962). M.A., George Washington. Arthur Young and Company, New York and Washington. Taught at American, Florida State, George Washington, Pittsburgh, and Syracuse. (Special Program)
- CLOSE, KENNETH G., (1964). B.S., River Falls (Wisconsin) State. Chief, Programming Branch, Bureau of Public Roads, Department of Commerce. Taught at River Falls State. (Mathematics and Statistics)
- COBB, EDWARD S., (1947). Head, Specifications and Test Division, U. S. Naval Photographic Center. (Technology)
- COGGESHALL, WALDEN, (1959). M.A., George Washington. Assistant Director, Division of Management Research, Office of the Secretary, Department of Interior. (Public Administration)
- COLBERT, ROY V., (1961). B.A., Arizona State. Director, Training and Development, Post Office Department. (Public Administration)
- COLLINGS, MARY L., (1952). D.Ed., George Washington. Staff Development Specialist, Extension Research and Training, Federal Extension Service, USDA. (Committee on Correspondence Study and Extension Education)
- COMPTON, LAWRENCE V., (1952). M.A., California. Head Biologist, Plant Technology Division, Soil Conservation Service, USDA. (Biological Sciences)
- COOK, CHARLES E., (1959). B.A., Washington. Cartographer, Photogrammetry Division, U. S. Coast and Geodetic Survey, Department of Commerce. Taught at Coast and Geodetic Survey. (Technology)
- COOK, RICHARD F., (1955). B.A., National, C.P.A. Management Consultant. Taught at American, Catholic, and Strayer. (Public Administration)
- COOPER, DENIS A., (1961). Licentiat in Drept., Cernauti (Rumania). Ph.D., Cluj (Rumania). J.D. George Washington. Lieutenant Colonel, U. S. Air Force. *Retired*. Special Procurement Projects Officer, Small Business Administration. Taught at Volkshochschule, Wiesbaden (Germany). (Public Administration)
- COOPER, JOHN C., JR., (1946). B.A., Furman. Director, Office of Management Appraisal and Systems Development, USDA. (Public Administration)
- CORNFIELD, JEROME, (1940). B.S., New York. Acting Chief, Biometrics Research Branch, National Heart Institute, National Institutes of Health, Department of Health, Education, and Welfare. Taught at Johns Hopkins and Stanford. (Mathematics and Statistics)
- CORNSWEET, ALBERT C., (1947). Ph.D., North Carolina. Chief, Psychology Service, Mental Hygiene Clinic, Veterans Benefits Office, Veterans Administration. Clinical Consultant in Training in Psychology at Catholic. Taught at Brown, Catholic, and North Carolina. (Social Sciences)
- CRAVEN, JOHN P., (1964). Ph.D., State University of Iowa. Chief Scientist, Special Projects, Bureau of Naval Weapons, Department of the Navy. Taught at California Institute of Technology, Maryland, New York, and Walter Hervey, Jr. (Technology)
- CRESWELL, THOMAS J., (1962). B.S. in E., George Washington. Agency Safety Engineer, Office of Personnel and Training, Federal Aviation Agency. (Public Administration)
- CULLINANE, JOHN J., (1959). B.E.E., Catholic. Electronic Engineer, Harry Diamond Laboratory. (Technology)
- CUMMINGS, JOSEPH D., (1964). LL.B., Catholic. Attorney-Advisor, Forestry and Soil Conservation Division, Office of the General Counsel, USDA. Taught at Scranton (Pennsylvania) Public Schools. (Correspondence)
- CUMMINS, ROBERT V., (1963). M.S., Denver. Budget Methods Specialist, Office of Budget Review, Bureau of the Budget. Taught at New Mexico. (Public Administration)
- CUNNINGHAM, JOSEPH F., (1961). Associate Director, Data Automation, U. S. Air Force. Adjunct Professor, School of Government and Public Administration, American University. (Special Program)
- CUNNINGHAM, VIRGINIA, (1960). B.A. and Certificate in Library Science, Wisconsin. Head, Music Section, Descriptive Cataloging Division, Library of Congress. (Languages and Literature)
- CUPOLI, JAMES V., (1959). Artist and Art Teacher. Taught at Corcoran and Columbia Technology Schools of Art. (Technology)
- CURTIS, JOHN M., (1962). Ph.D., Maryland. Professor and Head, Department of Agricultural Economics, College of Agriculture, University of Maryland. Taught at Maryland and North Carolina State. (Social Sciences)
- CZAJKOWSKI, ANTHONY F., (1960). Ph.D., Fordham. Administrative Officer, United States Government. Taught at Fordham, George Washington, and St. Louis. (Social Sciences)
- DALY, JOSEPH F., (1941). Ph.D., Princeton. Chief Mathematical Statistician, Bureau of the Census, Department of Commerce. Taught at Catholic, Princeton, and Stanford. (Mathematics and Statistics)
- DAVIDSON, ALFRED J., (1962). B.A., Columbia. Public Health Administrator, Malaria Eradication Branch, Agency for International Development, Department of State. (Public Administration)
- DAVIDSON, EUGENE J., (1962). J.D., New York. Assistant General Counsel, Procurement, Inter-Agency, and Administrative Division, Small Business Administration. (Public Administration)
- DAVIS, RAYMOND, (1946). Consultant, Optics and Metrology Division, National Bureau of Standards, Department of Commerce. *Retired*. (Technology)
- DE ANGELIS, MANLIO F., (1957). M.S., Syracuse. Deputy Assistant Administrator (Management), Bureau for Africa, Agency for International Development, Department of State. Taught at Bologna (Italy), California, and Florida State. (Committee on Correspondence Study and Extension Education)
- DE RUYTER, JOHN N. M. N., (1964). Digital Computer Systems Administrator, Technical Services Division, Computer Center, U. S. Navy Marine Engineering Laboratory, Department of the Navy. (Office Techniques)
- DEXTER, WAYNE V., (1950). B.S., Kansas State. Chief, Division of Information, Office of Management Services, USDA. (Committee on Information)
- DIAMOND, ANTHONY T., (1962). M.S., Cornell. Aerospace Technologist, Man Space Flight, Program Control. National Aeronautics and Space Administration. (Mathematics and Statistics)
- DICKER, GORDON K., (1964). M.S., Illinois. Assistant for Materials, U. S. Atomic Energy Commission. (Physical Sciences)
- DINSMORE, WILLIAM S., (1962). M.A., American. Assistant to Assistant Commissioner for Procurement, Federal Supply Service, General Services Administration. (Public Administration)
- DIX, WALTER S., (1952). Executive Secretary, American Congress on Surveying and Mapping. (Technology)
- DOLAN, MARIE A., (1959). M.A., American. Feature Writer, International Press Service, Far East, U. S. Information Agency. (Languages and Literature)
- DONOVAN, HENRY A., (1941). Deputy Executive Assistant Administrator for Management, Agricultural Research Service, USDA. *Retired*. (Office Techniques)
- DOUGLASS, RAYMOND C., (1957). Ph.D., Stanford. Geologist, U. S. Geological Survey, Department of the Interior. Taught at American, Chile (South America), and Stanford. (Physical Sciences)
- DOW, LIDA, (1961). Sioux Falls. U. S. Army Materiel Command. Taught at Emerson Institute. (Office Techniques)



- DRAHEIM, E. R., (1942). Ph.D., Cornell. Chief, Employee Development Division, Office of Personnel, USDA. Taught at Cornell, Minnesota, and South Dakota State. (Special Program and Public Administration)
- DUNN, CARLOS R., (1957). M.S., Chicago. Meteorologist, U. S. Weather Bureau, Department of Commerce. (Physical Sciences)
- DURBIN, CHARLES G., (1960). D.V.M., Pennsylvania. Veterinary Medical Director, Food and Drug Administration, Department of Health, Education, and Welfare. (Biological Sciences)
- DURSTON, THOMAS M., (1964). Member, Board of Contract Appeals, Department of the Interior. (Public Administration)
- DWYER, EDMUND D., (1957). LL.B., Georgetown. Chief, Navy Management Office, Department of the Navy. (Public Administration)
- EASTMAN, ANNE H., (1963). B.A., Hollins. Instructor, International Business Machines. (Mathematics and Statistics)
- EBENFIELD, ARTHUR D., (1963). M.A., Brown. Senior Economist. Taught at Brown and Rhode Island. (Social Sciences)
- EDWARDS, CLARK, (1963). Ph.D., Michigan State. Head, Demand Analysis Section, Economic Research Service, USDA. Taught at Oklahoma State. (Social Sciences)
- EDWARDS, GENIANA R., (1950). M.A., George Washington. Supervisory Publications Editor, Economic Research Service, USDA. (Languages and Literature)
- ELDRIDGE, FRANK R., (1959). Author. Taught at Columbia, Georgetown, George Washington, and New York. (Social Sciences)
- ELLENBERGER, JACK S., (1963). M.S. in L.S., Columbia. Librarian, Covington and Burling, Washington, D. C. (Languages and Literature)
- ELLER, JEROME N., (1953). B.A., St. John's. Administrative Assistant to Senator Eugene J. McCarthy of Minnesota. (Public Administration)
- ELLINGWOOD, CECIL, (1957). B.S., New Hampshire. Geodesist, U. S. Coast and Geodetic Survey, Department of Commerce. (Technology)
- ELLIS, N. R., (1952). M.S., Wisconsin. Associate Director, Animal Husbandry Research Division, Agricultural Research Service, USDA. (Agricultural Research Center Committee and Biological Sciences)
- ENNEIS, JAMES M., (1957). M.S., Georgia. Supervisory Psychodramatist, St. Elizabeths Hospital, Department of Health, Education, and Welfare. Taught at Georgia. (Committee on Academic Excellence and Public Administration)
- ESTEN, RANDALL D., (1952). M.S., Syracuse. Chief, Photogrammetry Division, U. S. Army Engineer Geodesy, Intelligence, and Mapping Research and Development Agency, Department of the Army. Taught at Syracuse. (Technology)
- EYSENBERG, MAURICE H., (1956). Art Institute of Chicago. Illustrator, Department of State. Taught at Abbott Art School and Chicago. (Technology)
- FARR, MARIE L., (1963). Ph.D., State University of Iowa. Mycologist, Mycology Investigations, Crops Protection Research Branch, Crops Research Division, Agricultural Research Service, USDA. (Languages and Literature)
- FEDIAY, VICTOR A., (1960). Ph.D., University of Warsaw (Poland). Senior Analyst and Group Supervisor, Reference Department, Library of Congress. (Languages and Literature)
- FEINSTEIN, LOUIS, (1962). Ph.D., Georgetown. Assistant Branch Chief, Field Crops and Animal Products Branch, Market Quality Research Division, Agricultural Marketing Service, USDA. Taught at Pennsylvania. (Physical Sciences)
- FELDMAN, DENNIS S., (1956). B.A., New York. Deputy Director, Information Services, Federal Aviation Agency. (Languages and Literature)
- FELLOWS, ROBERT F., (1963). Ph.D., Brown. Chief, Chemistry Program, Office of Space Science and Applications, National Aeronautics and Space Administration. Taught at Williams. (Physical Sciences)
- FERGUSON, EVELYN-HILARY, (1962). M.A., Trinity (Dublin, Ireland). Taught at Northern Ireland Public Schools. (Special Program)
- FERRARE, GEORGE D., (1959). B.S., Michigan State. Director, Division of Administrative Services, Forest Service, USDA. (Public Administration)
- FINDLAY, JOSEPH P., (1947). B.A., George Washington. Chief, Division of Personnel, Office of Management Services, USDA. (Public Administration)
- FINLATOR, JOHN H., (1959). B.A., North Carolina State. Director, Manpower Resources, General Services Administration. Taught at Raleigh, North Carolina. Public Schools. (Public Administration)
- FINVER, LESTER J., (1963). M.B.A., College of the City of New York. Inventory Management Specialist, Office of Supply Management, General Services Administration. Taught at General Services Administration Institute. (Public Administration)
- FISHER, JOSEPH L., (1962). Ph.D., Harvard. President, Resources for the Future, Inc. Taught at Allegheny, Colorado, and Harvard. (Social Sciences)
- FITCH, DAVID J., (1964). Ph.D., Illinois. Research Psychologist, Division of Research, Peace Corps, Department of State. Taught at Illinois. (Social Sciences)
- FITTON, H. NELSON, JR., (1962). M.A. George Washington. Chief, Editorial Branch, Publications Division, Office of Information, USDA. (Languages and Literature)
- FITZPATRICK, RICHARD S., (1947). Ph.D., American. Chief, Reports Branch, Agency Library, Research and Reference Service, U. S. Information Agency. Taught at American. (Social Sciences)
- FLAVIN, THOMAS J., (1946). LL.B., Georgetown. Judicial Officer, Office of the Secretary, USDA. Taught at Georgetown. (Public Administration)
- FLICK, DONALD F., (1963). Ph.D., George Washington. Biochemist, Division of Nutrition, Food and Drug Administration, Department of Health, Education, and Welfare. Taught at George Washington and West Virginia. (Physical Sciences)
- FLOOD, MAITLAND K., (1964). B.A., Maryland. Instructor, International Business Machines. (Mathematics and Statistics)
- FLORY, EVAN L., (1954). Ph.D., Nebraska. Chief, Branch of Land Operations, Bureau of Indian Affairs, Department of the Interior. (Technology)
- FONDREN, JAMES P., (1954). B.S.C.E., Arkansas. Cartographer, Soil Conservation Service, USDA. (Technology)
- FONFARA, EDWARD W., (1950). Cartographer, U. S. Naval Oceanographic Office, Department of the Navy. (Technology)
- FORTE, RUSSELL T., (1963). Visual Information Specialist, Photography Division, Office of Information, USDA. (Technology)
- FOSTER, ALBERT B., (1962). B.S., Missouri. Chief, Program Services Branch, Information Division, Soil Conservation Service, USDA. (Biological Sciences)
- FOSTER, JACK H., (1958). M.A., Michigan. Director of Personnel, Arlington County, Virginia. (Public Administration)
- FOSTER, WILLIAM A., (1955). M.S., University of the State of New York. Head, Bathymetric Branch, U. S. Naval Oceanographic Office, Department of the Navy. (Technology)
- FOX, STEWART B., JR., (1964). B.S., Florida State. Statistician, Office of Statistical Programs, Post Office Department. Taught at Florida State. (Mathematics and Statistics)
- FREDERICK, EUGENE W., (1962). Illustrator, Graphic Arts Branch, Office of the Comptroller, Department of the Army. (Technology)
- FRETTS, CARL A., (1946). B.S., Pittsburgh. C.P.A., Assistant Manager, Federal Crop Insurance Corporation, USDA. *Retired*. Taught at Pittsburgh. (Committee on Internal Audit)
- FRIEDMAN, S. J., (1955). B.S., George Washington. Executive Vice President, O.M.I. Corporation of America, Alexandria, Virginia. (Technology)
- FRIEDMAN, WILLIAM (1956). B.S., Queens. Plant Quarantine Inspector (Training-Nematology), Division Training Center, Plant Quarantine Division Agricultural Research Service, USDA. (Biological Sciences)
- FRITZ, SIGMUND, (1953). Sc.D., Massachusetts Institute of Technology. Chief, Meteorological Satellite Laboratory, U. S. Weather Bureau, Department of Commerce. (Physical Sciences)
- FUCHS, ROBERT H., (1949). B.A., American. Accountant. (Office Techniques and Public Administration)
- FUSILLO, MATTHEW H., (1963). M.S., George Washington. Chief, Microbiology Laboratory, Mount Alto Veterans Administration Hospital, Veterans Administration. Taught at Mount Alto. (Biological Sciences)



- GAMBINO, LAWRENCE A., (1962). B.A., Syracuse. Mathematician, GIMRADA, Fort Belvoir, Virginia. (Mathematics and Statistics)
- GANNT, PAUL H., (1958). J.U.D., Vienna; B.C.L., William and Mary. Chairman, Board of Contract Appeals, and Assistant Solicitor, Branch of Claims and Contract Appeals, Department of the Interior. Taught at William and Mary. (Public Administration)
- GARDNER, KELSEY B., (1956). M.B.A., Harvard. Consultant on Farmer Cooperatives and formerly Director, Management Services Division, Farmer Cooperative Service, USDA. (Office Techniques)
- GARNETT, JOHN R., (1957). B.S., Virginia. Chief, Branch of Employment, Division of Personnel Management, Office of the Secretary, Department of the Interior. Taught at Lycée Carnot (Dijon, France). (Public Administration)
- GAROFALO, JOSEPH T., JR., (1963). M.B.A., U. S. Air Force Institute of Technology. Chief, Manned Spacecraft Preflight Operations, Office of Manned Space Flight (OMSF), Headquarters, National Aeronautics and Space Administration. (Technology)
- GARSON, WARFIELD, (1963). M.D., University of Southern California. Chief, Division of Career Development, Office of Personnel, Office of Surgeon General, Public Health Service, Department of Health, Education, and Welfare. (Biological Sciences)
- GAUTHEY, J. RICHARD, (1963). M.S., California. Project Officer, Preliminary Design Branch, Bureau of Ships, Department of the Navy. (Mathematics and Statistics)
- GEHRING, J. H., (1949). C.E., Rutgers. Manager, Chief of Naval Operations (DNC), Bureau of Ships, and Office of Naval Research Branch, Bureau of Yards and Docks, Department of the Navy. (Technology)
- GERRETSON, FRED W., (1954). Ph.B., Wisconsin. Government Representative for Photo Products Departments, E. I. du Pont de Nemours and Company. (Technology)
- GIESECKE, HANS, (1961). M.E.E., University of Hannover (Germany). Chief, Experimentation Division, Systems Research and Development Service, Federal Aviation Agency (FAA)
- GRAYTYS, JAMES, (1964). M.S., Pennsylvania State. Captain, United States Air Force-Environmental Services Officer, Headquarters, Fourth Weather Group, United States Air Force. Taught at Pennsylvania State. (Physical Sciences)
- GISVOLD, PAUL A., (1962). Nav.E., Massachusetts Institute of Technology. Bureau of Ships, Department of the Navy. Taught at Minnesota. (Mathematics and Statistics)
- GLICKMAN, ALBERT S., (1964). Ph.D., Ohio State. Chief, Personnel Research Staff, Office of Personnel, USDA. Taught at Georgia Institute of Technology and George Washington. (Public Administration)
- GODBOLD, JOHN W., (1964). M.P.A., St. Louis. Deputy Assistant Administrator for Personnel and Training, Office of Personnel and Training, Federal Aviation Agency. Taught at Southern Illinois. (Special Program)
- GOODE, EDWIN R., JR., (1959). D.V.M., Auburn. Assistant to Administrator, Farm Research, Agricultural Research Service, USDA. (Biological Sciences)
- GOODYEAR, HUGO V., (1960). B.S., Tampa. Meteorologist (Research), U. S. Weather Bureau, Department of Commerce. Taught at Florida and Tampa. (Physical Sciences)
- GRAHAHAN, DAVID M., (1957). Minneapolis School of Art, Traveling Scholarship. Chief, Exhibit Service, Office of Information, USDA. (Languages and Literature and Technology)
- GRANT, CHARLES L., (1943). Director of Finance and Budget Officer, Office of the Director, Office of Budget and Finance, USDA. (Public Administration)
- GREEN, FOREST H., (1959). M.S.C.E., Purdue. Design Engineer, Bureau of Public Roads, Department of Commerce. Taught at Purdue. (Technology)
- GREEN, JOSEPH, JR., (1957). M.A., Boston College. Management Development Division, Office of Training, National Security Agency. (Social Sciences)
- GREENEISEN, JON F., (1962). M.S., Illinois. Information Specialist, Office of Information, USDA. Taught at Illinois. (Languages and Literature)
- GREENWOOD, JAMES W., JR., (1963). M.A., American. Director, Office of Management Policy, Office of the Secretary, Department of Health, Education, and Welfare. (Public Administration)
- GREESS, LEONARD, (1963). B.C.S., New York. Assistant Inspector General for Policy and Plans, USDA. Taught at St. Mary's (San Antonio, Texas). (Public Administration)
- GREGG, JOHN G., (1962). LL.M., Georgetown. Counsel, Defense Communications Agency, Department of Defense. Taught at American and Loyola. (Public Administration)
- GRESSETT, GEORGE L., (1961). B. A., Eastern Nazarene. Systems Engineering Manager, International Business Machines. (Mathematics and Statistics)
- GRENDLING, FRANK J., (1961). Employee Development Officer, Systems Research and Development Service, Federal Aviation Agency. (FAA)
- GROSS, WILLIAM J., (1953). Property Management Officer, Supply and Property Management Division, Office of Plant and Operations, USDA. (Public Administration)
- GUIDRY, NELSON P., (1947). Geographer, Economic Research Service, USDA. (Mathematics and Statistics)
- GUNTHER, V. SAMUEL, (1959). Chief, Procurement and Contract Management Division, Office of Plant and Operations, USDA. (Office Techniques)
- HADY, THOMAS F., (1963). Ph.D., Minnesota. Fiscal and Financial Economist, Farm Production Economics Division, Economic Research Service, USDA. Taught at Minnesota. (Social Sciences)
- HALL, DAVID G., (1954). M.S., Kansas State. Chief, Publications Branch, Information Division, Agricultural Research Service, USDA. Taught at Arkansas. (Committee on Information)
- HALL, FOREST J., (1955). B.Litt., Notre Dame. Supervisory Publications Editor, Agricultural Marketing Service, USDA. Retired. (Committee on Publications)
- HALL, ROBERT T., (1948). M.S., Oregon. Chief, Editorial Branch, Division of Information and Education, Forest Service, USDA. (Committee on Publications)
- HALSMAN, JULIUS, (1955). Chief, Photography Division, Armed Forces Institute of Pathology. (Technology)
- HAMILTON, LLOYD W., (1961). LL.B., George Washington. Partner, Arthur Young and Company, Washington, D. C. Taught at George Washington. (Public Administration)
- HAMM, JOSEPH F., (1954). B.C.S., Columbus. Head, Lithographic Section, Soil Conservation Service, USDA. (Technology)
- HANSEN, MORRIS H., (1939). M.A., American. Assistant Director, Research and Development, Bureau of the Census, Department of Commerce. Taught at American. (Mathematics and Statistics)
- HARMAN, SUSAN E., (1937). Ph.D., Johns Hopkins. Emeritus Professor of English, University of Maryland. (Languages and Literature)
- HARMON, FRANCIS L., (1964). Ph.D., Columbia. Assistant Chief, Personnel Research Staff, Office of Personnel, USDA. Taught at St. Louis. (Public Administration)
- HARMS, JOHN, (1962). Ed.M., Pittsburgh. Director of Personnel, Naval Research Laboratory, Department of the Navy. Taught at Iowa State. (Physical Sciences)
- HARRISON, FLOYD P., (1961). Ph.D., Maryland. Associate Professor of Entomology, University of Maryland. (Biological Sciences)
- HARRISON, H., (1961). Ph.D., Catholic. Chief, Electrophysics Branch, Research Division, Directorate of Research, Office of Advanced Research and Technology, National Aeronautics and Space Administration. Taught at Air Corps Technical School, Scott Field (Illinois). (Physical Sciences)
- HART, WILSON R., (1962). S.J.D., Virginia. Director of Labor Relations, Office of Manpower, Defense Supply Agency, Department of Defense. (Public Administration)
- HEARNE, CANNON C., (1948). M.S., Wisconsin. Director, Foreign Training Division, International Agricultural Development Service, USDA. (Committee on Correspondence Study and Extension Education and Social Sciences)
- HEIN, CLARENCE J., (1960). Ph.D., Minnesota. Fiscal Economist, Agricultural Finance Branch, Economic Research Service, USDA. Taught at Kansas, Minnesota, and West Virginia. (Public Administration)
- HENDEE, CLARE, (1957). M.A., George Washington. Deputy Chief for Administration, Forest Service, USDA. (Public Administration)

- HENDERSON, CHRISTOPHER O., (1942). M.S., Cornell. Assistant Director of Personnel, Office of Personnel, USDA. (Public Administration)
- HENDERSON, JOHN K., (1962). B.A., West Virginia. Systems Analyst, UNIVAC Division, Sperry Rand Corporation. (Mathematics and Statistics)
- HENDRIX, WILLIAM E., (1962). Ph.D., Wisconsin. Agricultural Economist, International Development and Trade Analysis Division, Economic Research Service, USDA. Taught at Chicago. (Social Sciences)
- HERBY, JAMES E., (1964). B.S., Columbia. Employee Development Officer, Bureau of Personnel, Post Office Department. (Special Program)
- HERMANSEN, H. V., (1961). Acting Chief, Evaluation Division, Systems Research and Development Service, Federal Aviation Agency. Taught in U. S. Navy. (FAA)
- HERRELL, HENRY G., (1957). LL.B., National (George Washington). Deputy Administrator, Management, Agricultural Marketing Service, USDA. (Public Administration and Special Program)
- HIBAN, ANN B., (1962). B.A., Duke. Taught at International Business Machines Educational Center. (Mathematics and Statistics)
- HICKEY, THOMAS J., (1943). LL.M., Columbus. Comptroller, Bureau of Medicine and Surgery, Department of the Navy. (Office Techniques)
- HICKS, STEACY D., (1964). M.S., Scripps Institution of Oceanography. Physical Oceanographer, Office of Oceanography, U. S. Coast and Geodetic Survey, Department of Commerce. Taught at Rhode Island. (Physical Sciences)
- HILBERT, G. E., (1950). Ph.D., Yale, Director, Foreign Research and Technical Programs Division, Agricultural Research Service, USDA. (Public Administration)
- HILSENATH, JOSEPH, (1957). M.A., Montclair State Teachers College. Chief, Equation of State Section, Heat Division, National Bureau of Standards, Department of Commerce. (Physical Sciences)
- HOFFMANN, CLARENCE H., (1955). Ph.D., Minnesota. Assistant Director, Entomology Research Division, Plant Industry Station, USDA. Taught at Minnesota. (Agricultural Research Center Committee and Biological Sciences)
- HOLLAND, FREDRICK C., (1963). M.S. in E.E., Stanford. Manager, Air Traffic Control Project, Bunker-Ramo Corporation. (FAA)
- HOOKS, LANCE, (1956). Public Information Officer, Marketing Information Division, Agricultural Marketing Service, USDA. (Committee on Information)
- HORD, WARNER H., (1945). M.B.A., Harvard. Chief, Office of Carrier Accounts and Statistics, Civil Aeronautics Board. Taught at Tulane. (Public Administration)
- HORNSTEIN, IRWIN, (1963). Ph.D., Georgetown. Research Chemist, Market Quality Research Division, Agricultural Marketing Service, USDA. (Physical Sciences)
- HOUSEMAN, EARL E., (1951). M.S., South Dakota. Director, Standards and Research Division, Statistical Reporting Service, USDA. Taught at Iowa State. (Mathematics and Statistics)
- HOWARD, JAMES O., (1960). Ph.D., Iowa. Director, Trade Projects Division, Foreign Agricultural Service, USDA. Taught at Duke. (Social Sciences)
- HUBBARD, HENRY F., (1955). Ph.D., George Washington. Personnel Officer, District of Columbia Government. Taught at George Washington. (Public Administration)
- HUBERT, LESTER F., (1955). M.S., Chicago. Meteorologist, U. S. Weather Bureau, Department of Commerce. (Physical Sciences)
- HUDDLESTON, HAROLD F., (1956). M.A., Michigan State. Mathematical Statistician, Statistical Reporting Service, USDA. Taught at Michigan State. (Mathematics and Statistics)
- HURLEY, JOHN J., (1963). M.A., Columbia. Business Economist, Office of Executive Director, Federal Trade Commission. Taught at Gettysburg, Le Moyne, and William and Mary. (Social Sciences)
- HURTT, ALVIN J., (1961). M.S., Illinois. Chief, Training and Development Division, Personnel Service, Department of Medicine and Surgery, Veterans Administration. (Public Administration)
- HUSSONG, WILLIAM J., JR., (1963). Nav.E., Massachusetts Institute of Technology. Head, Aircraft Carrier and Seaplane Tender Branch, Bureau of Ships, U. S. Navy. (Mathematics and Statistics)
- JACKSON, SETH, (1957). B.S., Cornell. Chief, Branch of Safety and Employee Relations, Forest Service, USDA. Chairman, Society of American Foresters' Committee on Safety; Member, American Society of Safety Engineers, Coordinating Committee, Federal Safety Council, and Woods Products Section, National Safety Council. (Correspondence)
- JACOBSON, DOROTHY H., (1963). M.A., Minnesota. Assistant Secretary for International Affairs, USDA. Taught at Macalester. (Public Administration)
- JAFFE, ERWIN, (1947). Ph.D., Harvard. Plans and Programs Officer, National Flight Data Center, Flight Information Division, Air Traffic Service, Federal Aviation Agency. Taught at Harvard. (Languages and Literature)
- JANICKI, BERNARD W., (1964). Ph.D., George Washington. Research Microbiologist, Mount Alto Veterans Administration Hospital, Veterans Administration. (Biological Sciences)
- JAQUITH, RICHARD H., (1961). Ph.D., Michigan State. Associate Professor of Chemistry, University of Maryland. Taught at Colby, Connecticut, Massachusetts, and Michigan State. (Physical Sciences)
- JEBENS, ARTHUR B., (1953). J.D., Iowa. Director of Management Research, Office of the Secretary, Department of the Interior. (Public Administration)
- JESSEL, J. J. A., (1942). D.Sc., Harvard. Chief, Division of Electric Resources and Requirements, Bureau of Power, Federal Power Commission. Taught at Harvard. (Technology)
- JESSOP, BRIAN R., (1964). B.S.C., London. Engineer, Power Plants Branch, Power Supply Division, Rural Electrification Administration, USDA. (Technology)
- JEX, GARNET W., (1955). M.F.A., George Washington. Chief, Graphics Section, Bureau of State Services, U. S. Public Health Service, Department of Health, Education, and Welfare. *Retired.* (Technology)
- JOFFE, NORMAN, (1962). B.E.E., Catholic. Senior Principal Electronics Engineer, Emerson Information and Control Division, Litton Industries, Inc. Taught at Virginia. (Technology)
- JOHNS, FRANK G., (1963). M.A., American. Personnel Officer, Chief, Outplacement Service, Central Intelligence Agency. (Social Sciences)
- JOHNSON, GARLAND T., (1964). M.S., Cincinnati. Supervisor, Chronic Toxicology Section, Hazleton Laboratories, Inc. Taught at Cincinnati. (Biological Sciences)
- JOHNSON, JUDITH, (1962). B.S., Iowa State. Taught at International Business Machines Educational Center. (Mathematics and Statistics)
- JOHNSON, SHERMAN E., (1937). Ph.D., Harvard. Deputy Administrator for Foreign Economics, Economic Research Service, USDA. Taught at Minnesota, Montana State, and South Dakota State. (Social Sciences)
- JOHNSTON, DENIS F., (1962). Ph.D., American. Labor Economist, Division of Manpower and Employment Statistics, Bureau of Labor Statistics, Department of Labor. Taught at American and Howard. (Social Sciences)
- JONES, ALLEN H., (1957). M.A., Temple. Head, Department of English, Montgomery Junior College. Taught at Girard, Montgomery Junior College, and Muhlenberg. (Languages and Literature)
- JOSEPHSON, HORACE R., (1949). Ph.D., California. Director, Division of Forest Economic and Marketing Research, Forest Service, USDA. Taught at California. (Social Sciences)
- KAHN, DONA S., (1960). LL.B., Rutgers. Attorney, General Regulatory Division, Office of the General Counsel, USDA. (Correspondence)
- KANNINEN, TOIVO, (1964). Chief, Division of Occupational Pay, Bureau of Labor Statistics, Department of Labor. (Public Administration)
- KAPLAN, SYLVAN J., (1963). Ph.D., Stanford. Deputy Director, Division of Selection, Peace Corps, Department of State. Taught at Brooklyn, Stanford, Texas, Texas Technological, and Yale. (Social Sciences)
- KAUFHOLZ, FERDINAND, (1949). B.C.E., Johns Hopkins. Director, Program Management Office, Public Buildings Service, General Services Administration. (Technology)
- KAZYAK, LEO, (1963). B.S., Detroit. Toxicologist, Division of Biochemistry, Walter Reed Army Institute of Research, Walter Reed Army Medical Center. (Physical Sciences)



- KEIM, S. D., (1960). B.S., Maryland. Head Engineer, Marine Corps and Amphibious Electronics Branch, Electronics Division, Bureau of Ships, Department of the Navy. (Technology)
- KEISER, HENRY B., (1960). LL.B., Harvard. Attorney and Publisher of *The Government Contractor*. Taught at George Washington. (Public Administration)
- KELLY, WILLIAM B., JR., (1963). Ph.D., Fletcher School of Law and Diplomacy, Tufts. Director, Trade Negotiations Staff, Office of Commercial and Financial Policy, Department of Commerce. Taught at Boston University, Fletcher School of Law and Diplomacy, and Georgetown. (Social Sciences)
- KIBLER, WILLIAM E., (1963). M.S.A., Georgia. Mathematical Statistician, Standards and Research Division, Statistical Reporting Service, USDA. (Mathematics and Statistics)
- KIEFER, CHARLES F., (1958). M.P.A., Harvard. Director, Office of Management Services, USDA. (Special Program)
- KILPATRICK, FRANKLIN P., (1960). Ph.D., Princeton. Senior Staff Member, The Brookings Institution. Taught at Princeton. (Social Sciences)
- KINNEY, TERRY B., JR., (1963). Ph.D., Minnesota. Biometrician, Agricultural Research Service, USDA. (Mathematics and Statistics)
- KIRBY, JOSEPH F., (1961). B.S. in S.Sc., American Supply and Property Management Office, Supply and Property Management Division, Office of Plant and Operations, USDA. (Public Administration)
- KIRKHAM, MARK M., (1954). Graduate study, University of Chicago. Management Analyst, Office of Management, Department of State. (Office Techniques and Public Administration)
- KLIMAN, ALBERT J., (1962). M.P.A., Harvard. Budget Examiner, Division of Budget Policies and Operations, Office of Budget and Finance, USDA. (Office Techniques)
- KNIPLING, EDWARD F., (1954). Ph.D., Iowa State. Director, Entomology Research Division, Agricultural Research Service, USDA. (Biological Sciences)
- KOCH, E. JAMES, (1953). M.S., North Carolina State. Biometrician, Agricultural Research Service, USDA. (Biological Sciences)
- KOEBEL, RALPH F., (1943). S.J.D., Georgetown. Assistant General Counsel, Office of the General Counsel, USDA. (Public Administration)
- KOENIG, EDWARD H., (1963). M.A., Columbia and Cornell. Information Specialist, Special Reports Division, Office of Information, USDA. (Languages and Literature)
- KONKLE, WARD W., (1960). B.A., Pittsburgh. Editor, Agricultural Science Review, Cooperative State Experiment Station Service, USDA. Taught at Wooster High School (Ohio). (Correspondence)
- KOSOFKY, LEON J., (1964). M.S., Minnesota. Lunar Orbiter Program Engineer, Office of Space Sciences and Applications, National Aeronautics and Space Administration. (Technology)
- KOTEEN, JACK, (1957). B.A., New York. Assistant Chief, Planning Assistance Division, Agency for International Development, Department of State. Taught at American. (Public Administration)
- KOZAK, KATHERINE B., (1957). Free Lance Writer and Indexer. (Languages and Literature)
- KRAMER, SAMUEL A., (1962). Ph.D., Ohio State. Analyst in Medical and Health-related Fields, Children's Bureau, Department of Health, Education, and Welfare. Taught at Ohio State. (Social Sciences)
- KRIESBERG, MARTIN, (1952). Ph.D., Harvard. Marketing Economist, Economic Research Service, USDA. Adjunct Professor, American University. Taught at Michigan. (Public Administration)
- KRUEGER, LOUISE M., (1946). M.A., George Washington. Staff Accountant, Accounting Division, Office of Management Services, Federal Aviation Agency. Taught at George Washington. (Office Techniques)
- KURI, SÄLME H., (1963). I.U.D., Freiburg (Germany). M.S. in L.S., Catholic. Supervisory Librarian, Cataloging Section, Library, Bureau of the Census, Department of Commerce. (Languages and Literature)
- LACKLEN, ROBERT J., (1964). M.A., Stanford. Director of Personnel, National Aeronautics and Space Administration. (Special Program)
- LAKEY, KEITH G., (1962). Nav.E., Massachusetts Institute of Technology. Commander, Head, Acquisition Management Planning and Review Office, Bureau of Ships, Department of the Navy. (Mathematics and Statistics)
- LANDO, ROBERT H., (1947). M.A., California. Management Analyst, Program Development Division, Office of Records Management, National Archives and Records Service, General Services Administration. (Office Techniques)
- LANE, IRA A., (1954). B.S., New York State College of Forestry. In Charge, Division Training Center, Plant Quarantine Division, Agricultural Research Service, USDA. (Biological Sciences)
- LANEY, ARTHUR R., (1961). Ph.D., George Washington. Assistant to Director of Personnel, Washington Gas Light Company. (Public Administration)
- LAWRENCE, JOHN S., (1964). M.A., Cornell. Training Officer, National Security Agency, Department of Defense. Taught at George Washington. (Languages and Literature)
- LAXTON, WILLIAM C., (1946). B.A., George Washington. Director, Personnel Division, Agricultural Marketing Service, USDA. (Public Administration)
- LAZZARI, PIETRO, (1944). Master Artist, Ornamental School of Rome. Belle Arti. Portrait artist, landscape painter, and graphic designer. Fulbright Research in Art Media and Technique. Taught at American and Beaux Arts Institute of Design, New York. (Technology)
- LEACH, BYRON E., (1964). Ph.D., Illinois. Research Chemist, Dairy Products Laboratory, Eastern Utilization Research and Development Division, Agricultural Research Service, USDA. (Physical Sciences)
- LEAHY, CLIFFORD J., (1961). Vice President, Tridea Electronics, Inc. (Committee on Academic Excellence and Technology)
- LE CLERG, E. L., (1949). Ph.D., Minnesota. Director, Biometrical Services Division, Agricultural Research Service, USDA. (Biological Sciences and Correspondence)
- LEDERER, MARIANNE, (1947). Lehramtsprüfung, University of Vienna. Taught at American. (Languages and Literature)
- LEEDY, DANIEL L., (1950). Ph.D., Ohio State. Chief, Division of Research and Education, Bureau of Outdoor Recreation, Department of the Interior. (Biological Sciences)
- LEFEBVRE, R. J., (1946). B.Ch., New York. Product Manager, Sumner Williams, Inc., Boston, Massachusetts. (Technology)
- LEHMANN, RICHARD P., (1963). Ph.D., North Carolina State. Biometrician, Biometrical Services, Agricultural Research Service, USDA. Taught at North Carolina State and Virginia Polytechnic Institute. (Mathematics and Statistics)
- LEHR, PAUL E., (1963). Meteorologist, Office of Deputy Director, National Weather Satellite Center, U. S. Weather Bureau, Department of Commerce. Taught at U. S. Air Force Weather School, Chanhute Air Force Base (Illinois). (Biological Sciences)
- LEICH, HAROLD H., (1946). M.A., American. Chief, Program Planning Division, Civil Service Commission. (Public Administration)
- LEVENBERG, MARVIN H., (1955). B.S., Georgetown. Supervisory Auditor, Agency for International Development, Department of State. (Public Administration)
- LEVERTON, RUTH M., (1962). Ph.D., Chicago. Assistant Administrator, Office of Administrator, Agricultural Research Service, USDA. Taught at Nebraska and Oklahoma State. (Biological Sciences)
- LEVIN, IRVIN, (1964). Ph.D., Maryland. Director, Instrumentation Division, Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Department of the Army. Taught at Maryland. (Physical Sciences)
- LEWIS, BRINLEY J., (1963). M.S. in P.A., Syracuse. Chief, Budget Division, Area Redevelopment Administration, Department of Commerce. Taught at Colorado College and Syracuse. (Office Techniques and Operations)
- LEWIS, KEITH B., (1946). B.A., Georgia. Manager, Washington Office, Eastman Kodak Company. (Technology)



- LIPES, JACK E., (1963). B.S., Purdue. Plant Quarantine Inspector (Training Officer-Entomology), Division Training Center, Plant Quarantine Division, Agricultural Research Service, USDA. (Biological Sciences)
- LOBB, JAMES H., (1954). B.S., Fordham. Chief, Division of Accounting, Payroll, and Audit Operations, Department of Labor. (Public Administration)
- LOGAN, CHARLES A., (1947). M.S., Kansas State. Director, Division of Operations, Agricultural Research Service, USDA. Taught at Kansas State. (Agricultural Research Center Committee)
- LONG, ERVEN J., (1962). Ph.D., Wisconsin. Director, Rural Development Service, Office of Technical Cooperation and Research, Agency for International Development, Department of State. Taught at Bangalore (India), Tennessee, and Wisconsin. (Social Sciences)
- LORING, BLAKE M., (1941). Sc.D., Massachusetts Institute of Technology. Consulting Metallurgist. Taught at Maryland and Massachusetts Institute of Technology. (Technology)
- LOTTI, THOMAS, (1964). M.S., Harvard. Assistant to Deputy Chief, Research, Forest Research Administration, Forest Service, USDA. (Biological Sciences)
- LOTTIDGE, DOUGLAS D., (1963). M.B.A., George Washington. Operations Research Analyst, Institute for Applied Technology, National Bureau of Standards, Department of Commerce. (Mathematics and Statistics)
- LUTKART, FORDYCE, (1964). B.A., Ohio Wesleyan. Senior Staff, The Brookings Institution. Taught at State Teachers College (Brookport, New York) and Syracuse. (Public Administration)
- LUSTIG, ERNEST, (1964). Ph.D., Massachusetts Institute of Technology. Chemist, Bureau of Scientific Research, Food and Drug Administration, Department of Health, Education, and Welfare. Taught at Georgetown and Massachusetts Institute of Technology. (Physical Sciences)
- LUTTRELL, DOROTHY M., (1947). Program Manager (Records and Paperwork Management), Internal Revenue Service, Department of the Treasury. (Office Techniques)
- LYMAN, JOHN, (1951). Ph.D., California. Program Director for Oceanography, National Science Foundation. (Physical Sciences)
- LYON, ROWLAND, (1946). M.A., George Washington. Curator of Fine Arts, National Collection of Fine Arts, Smithsonian Institution. Taught at George Washington. (Technology)
- MADDUX, JOHN L., (1963). M.A., Gonzaga (Spokane, Washington). Policy Officer, Office of Policy, U. S. Information Agency. Taught at Santa Clara. (Languages and Literature)
- MANDEL, BENJAMIN J., (1961). M.A., George Washington. Director, Office of Statistical Programs, Bureau of Finance, Post Office Department. Taught at Baltimore. (Public Administration)
- MANNING, JOHN G., (1963). M.Ed., Maryland. Training Director, Office of Administration, National Aeronautics and Space Administration. Taught at Air Force School for Personnel Management. (Special Program)
- MARTIN, DOROTHY M., (1958). B.A., Bates. Public Information Specialist, Forest Service, USDA. Taught at Appleton Academy and Quimby School (New Hampshire). (Committee on Information)
- MARTIN, W. HOWARD, (1956). Corcoran School of Art, Negative Work Supervisor, Cartographic Section, Soil Conservation Service, USDA. (Technology)
- MASON, CHARLES N., Sr., (1943). M.A., Montana. Accountant. Taught at George Washington and Montana. (Public Administration)
- MASSIE, E. S., (1961). C.E., South Carolina. Chief, Surveys and Maps Branch, Division of Engineering, Forest Service, USDA. (Technology)
- MATERAZZI, ALBERT R., (1948). D.Ch., Rome. Research Coordinator, Litho Chemical and Supply Company, Inc. (Technology)
- MATHER, R. J., (1963). B.S., Oregon State. Head, Transmission and Coordination Section, Bureau of Power, Federal Power Commission. (Technology)
- MATTHEWS, ALBERT W., (1957). Chief, Photographic Services, Office of Information, USDA. (Technology)
- MATTHEWS, EARLE D., (1963). Ph.D., Maryland. Soils Specialist, Maryland State Office, Soil Conservation Service, USDA. Taught at Arkansas and Tampa. (Biological Sciences)
- MATTHEWS, JOSEPH L., (1952). Ph.D., Chicago. Director, Division of Extension Research and Training, Federal Extension Service, USDA. (Committee on Academic Excellence)
- MAY, EUGENE F., (1952). Cartographer, Soil Conservation Service, USDA. (Correspondence)
- MCADAMS, TERRY J., (1958). George Washington. Chief, Division of Supply and Transportation Management, Office of Operations, Department of State. (Office Techniques)
- MCCLAIN, E. PAUL, (1963). Ph.D., Florida State. Research Meteorologist, Meteorological Satellite Laboratory, U. S. Weather Bureau, Department of Commerce. Taught at Chicago, Florida State, and Washington. (Physical Sciences)
- MCCLARREN, J. KENDALL, (1946). Director, International Trade Fairs Division, Foreign Agricultural Service, USDA. (Languages and Literature)
- McCORMICK, JAMES H., (1946). M.S., Georgetown. Assistant Director, Office of Information, USDA. (Committee on Publications and Languages and Literature)
- McCRACKEN, KELLY T., (1961). B.A., George Washington. Chief, Procurement and Supply Management Branch, Division of General Services, Office of Administration, Office of the Secretary, Department of Health, Education, and Welfare. (Office Techniques)
- McCULLOUGH, NORMAN L., (1960). Photographer, Research Analysis Corporation. (Technology)
- McCURLEY, JAMES B., (1960). D. Eng., Johns Hopkins. Director, Electric Distribution Division, Rural Electrification Administration, USDA. Taught at Yale and U. S. Naval Academy. (Mathematics and Statistics)
- McDANIEL, PAUL W., (1959). Ph.D., Indiana. Director, Division of Research, U. S. Atomic Energy Commission. Taught at Auburn. (Physical Sciences)
- McGANN, LEONARD D., (1962). Chief 1107 Computer Operations, Data Processing Systems Division, Bureau of the Census, Department of Commerce. (Mathematics and Statistics)
- McGRANE, EDWARD J., (1962). M.S. in E.E., Pennsylvania. Colonel, U. S. Army, Chief, Systems Implementation Division, National Military Command Systems Directorate, Defense Communications Agency, Department of Defense. (Mathematics and Statistics)
- MCINTYRE, RALPH G., (1962). LL.B., Columbus. Chief, Supply and Property Management Division, Office of Plant and Operations, USDA. (Public Administration)
- McKENNA, DUANE A., (1952). B.F.A., South Dakota. Staff Artist, *U. S. News & World Report*. (Technology)
- McOMBER, DALE R., (1962). M.A., Bowling Green State. Deputy Chief, Budget Preparation, Bureau of the Budget. Taught at Bowling Green State. (Office Techniques)
- McPHERSON, J. JAMES, (1964). Ed.D., Teachers College (Columbia). Head, Demonstration Center, Office of Education, Department of Health, Education and Welfare. Taught at Drake, Johns Hopkins, Occidental, University of California at Los Angeles, and Wayne State. (Social Sciences)
- MEEHAN, ROBERT H., (1962). Head, Office Methods, Navy Management Office, Department of the Navy. (Office Techniques)
- MEEKER, DONALD C., (1964). M.F.A., Pennsylvania. Chief, Design Section, Arts and Graphics Division, Office of Information, USDA. (Languages and Literature)
- MELNICK, EDWARD L., (1964). M.S., Virginia Polytechnic Institute. Mathematical Statistician, Bureau of the Census, Department of Commerce. (Mathematics and Statistics)
- MERCREDY, ROBERT B., (1955). M.A., Maryland. Geographer, Defense Intelligence Agency, Department of Defense. Taught at Maryland. (Technology)
- MERRILL, THEODORE W., (1963). B.S. in C.E., Iowa State. Associate Systems Engineer, International Business Machines. (Mathematics and Statistics)
- MERRITT, ALBERT R., (1957). Head, Equipment Evaluation Division, Photographic Center, Department of the Navy. (Technology)
- MILEHAM, HARRY P., (1947). M.A., Columbia. Chief of Publications, Office of Information, USDA. (Committee on Publications)
- MILES, WYNDHAM D., (1963). Ph.D., Harvard. Historian, National Institutes of Health, Department of Health, Education, and Welfare. Taught at Pennsylvania State. (Physical Sciences)

- MILESON, DONALD F., (1961). A.E., California Institute of Technology, Consulting Engineers, Mileson Associates, Falls Church, Virginia. (Technology)
- MILLER, LEON H., (1962). M.S. in I.E., Purdue. Operations Analyst, Research Analysis Corporation. Taught at Purdue. (Mathematics and Statistics)
- MILLER, MARTIN H., (1955). M.A., Western Reserve. Senior National Sales Representative, Savings Bonds Division, Department of the Treasury. Winner of many prizes and trophies for excellence in photography. Associate, Photographic Society of America. (Technology)
- MILLER, NORMA RENO, (1958). M.S., Wisconsin. Independent Public Relations Counselor. Taught at Maryland and Pittsburgh. (Languages and Literature)
- MINNIS, O. L., (1960). M.S., Iowa. Acting Deputy Director, Office of International Training, Agency for International Development, Department of State. Taught at Idaho and Montana State. (Social Sciences)
- MIXNIS, ROY B., (1961). Ph.D., State University of Iowa. Specialist, Adult Education, Adult Education Branch, Office of Education, Department of Health, Education, and Welfare. Taught at Chicago, Denver, Iowa, and Wyoming. (Committee on Academic Excellence)
- MINOR, WILLIAM A., (1946). B.S.A., Georgia. Assistant Administrator for Management, Foreign Agricultural Service, USDA. (Public Administration)
- MLELA, JOHANNES G., (1964). Foreign Language Broadcaster, Voice of America, U. S. Information Agency. Taught at Foreign Service Institute and St. Albans School. (Languages and Literature)
- MOHRHARDT, FOSTER E. (1955). M.A., Michigan. Director, National Agricultural Library, USDA. (Languages and Literature)
- MOLINARI, PRIMO F., (1964). B.S., West Virginia Institute of Technology. Estimator. (Technology)
- MORAN, LELA P., (1963). M.A., George Washington. Chief, Division of Acquisitions, National Agricultural Library, USDA. (Languages and Literature)
- MORGAN, EMMA, (1958). Cortland Teachers. Chief Housekeeper, D. C. General Hospital. Former Member of National Board of National Executive Housekeepers Association. Guest Lecturer, Lewis Hotel School. (Technology)
- MORTON, JOHN W., (1963). B.A., Dartmouth. Associate Instructor, International Business Machines. (Mathematics and Statistics)
- MOSHMAN, JACK, (1964). Ph.D., Tennessee. Vice President, Professional Staff Services, C-E-I-R, Inc. Taught at George Washington, Queens, and Tennessee. (Mathematics and Statistics)
- MOURE, RUPERT F., (1961). M.A., George Washington. Director, Division of Personnel Management, Food and Drug Administration, Department of Health, Education, and Welfare. Taught at Arlington County (Virginia) Schools. (Languages and Literature)
- MOUSER, C. M., (1953). M.A., Louisiana State. Chief Clerk, Senate Committee on Agriculture and Forestry. Taught at Sam Houston State and Northwestern State. (Office Techniques)
- MULLEN, ROY R., (1963). B.S., American. Civil Engineer, Branch of Research and Design, U. S. Geological Survey, Department of the Interior. (Technology)
- MURROW, BEN, (1956). Visual Information Officer, Arts and Graphics Division, Office of Information, USDA. Taught at Columbia Technical Institute and Washington and Lee. (Languages and Literature)
- MURRAY, WILLIAM R., (1964). B.S., Holy Cross. Captain, U. S. Marine Corps. Electronics Engineer, Bureau of Ships, Department of the Navy. Taught at George Washington. (Technology)
- MUTH, GEORGE E., (1960). LL.B., George Washington. President, George F. Muth Company, Inc., Washington, D. C. (Technology)
- MYERS, CHARLES T., JR., (1955). Chief, Photography Division, Office of Information, USDA. (Technology)
- NAVARRO, JOSEPH A., (1963). Ph.D., Purdue. Staff Member, Institute for Defense Analysis. (Mathematics and Statistics)
- NELSON, LIONEL W., (1957). M.A., Stetson. Director, Public Information Office. Speech Department, Montgomery Junior College. (Languages and Literature)
- NELSON, PAUL E., JR., (1963). Ph.D., Iowa State. Leader, Market Structure and Practices Group, Market Structure and Costs Branch, Marketing Economics Division, Economic Research Service, USDA. Taught at Denison and Maryland. (Social Sciences)
- NERBOSO, SALVATORE, (1955). Ph.D., Harvard. Professor of Political Science, Bowie State College. Taught at Maryland. (Public Administration)
- NEWMAN, ARTHUR E., (1963). B.S., American. Management Analyst, Information Processing Systems Staff, Office of Administration for Domestic and International Business, Department of Commerce. (Mathematics and Statistics)
- NICHOLS, A. J., (1952). D.P.A., Harvard. Regional Coordinator, Latin American Area, International Agricultural Development Service, USDA. (Public Administration)
- NICHOLSON, ROBERT E., (1964). B.A., American. Editorial Technician, National Security Agency, Department of Defense. (Languages and Literature)
- NISSELSON, HAROLD, (1946). B.S., College of the City of New York. Senior Scientist, Operations Research, Incorporated. Taught at American. (Mathematics and Statistics)
- NOFFSINGER, TERRELL L., (1964). Ph.D., Purdue. Agricultural Program Leader, Weather Analysis and Prediction Division, U. S. Weather Bureau, Department of Commerce. Taught at Hawaii, Kentucky, and Purdue. (Physical Sciences)
- NORDENSON, TOR, (1956). B.S., Michigan. Chief, Hydrologic Investigations Section, Hydrologic Services Division, U. S. Weather Bureau, Department of Commerce. (Physical Sciences)
- NORDIN, RUTH, (1959). B.A., George Washington. Head, Publications and Editorial Section, Soil Conservation Service, USDA. Taught at Nebraska Public Schools. (Languages and Literature)
- NORRIS, KARL H., (1960). B.S., Pennsylvania State. Leader (Agricultural Engineer), Instrumentation Research Laboratory, Market Quality Research Division, Agricultural Marketing Service, USDA. (Physical Sciences)
- NOWOTNY, ALBERT J., (1964). M.A., Texas. 1401-7094 Programmer Analyst, Air Battle Analysis Center, Headquarters, U. S. Air Force, Department of Defense. Taught at Dayton, San Bernardino Valley, and Texas. (Mathematics and Statistics)
- NUCCI, HUBERT P., (1961). B.A., University of the Americas. Mathematical Statistician, Office of Planning, Bureau of Public Roads, Department of Commerce. (Mathematics and Statistics)
- NUNN, W. R., JR., (1961). B.S. in C.E., Oklahoma. Deputy Director, Aeronautical Division, U. S. Naval Oceanographic Office, Department of the Navy. (Technology)
- O'BRIEN, JAMES C., (1955). LL.B., Columbus. Director of Personnel, Department of Health, Education, and Welfare. (Public Administration)
- OGREN, KENNETH E., (1958). Ph.D., Minnesota. Director, Marketing Economics Division, Economic Research Service, USDA. Taught at Minnesota. (Social Sciences)
- OLSON, KENNETH W., (1952). M.A., Michigan. Director, Foreign Market Information Division, Foreign Agricultural Service, USDA. (Languages and Literature)
- ORNSTEIN, JACOB, (1952). Ph.D., Wisconsin. Author and Teacher. Assistant Managing Editor, *Modern Language Journal* (for Slavic and East European Languages). Formerly Associate, Russian Research Center, Harvard University. Taught at Catawba, New Mexico State, Waldorf, and Wisconsin. (Languages and Literature)
- ORSINI, F. M., (1963). B.S., Georgia. Director, Cartographic Division, Soil Conservation Service, USDA. (Technology)
- OSBORN, BEN O., (1961). B.S., Oklahoma State. Writer-Editor, Information Division, Soil Conservation Service, USDA. (Biological Sciences)
- OSBORN, FRANCES L., (1963). M.A., North Carolina. Museum Curator, National Gallery of Art, Smithsonian Institution. Taught at Birmingham-Southern. (Technology)
- OSBORN, GORDON D., (1963). M.B.A., Harvard. Chief, Management Improvement and Research Branch, Office of Management and Organization, Bureau of the Budget. (Public Administration)
- OSGOOD, FREDERIC C., (1960). B.S., Oregon. Chief, Issuances Management Section, Office of Management Services, Federal Aviation Agency. Taught at Oregon. (Office Techniques)



- OTERO, JOSÉ, (1959). Madrid. Editor, Regional Office, World Health Organization. Taught in Argentina, Spain, and United States. (Languages and Literature)
- PAINÉ, HOWARD C., (1957). B.A., Nebraska. Chief, Borrowers' Accounting Branch, Controller's Division, Rural Electrification Administration, USDA. (Correspondence)
- PALENSKI, DANIEL E., (1963). M.B.A., American. Chief, Financial Management Branch, Bureau of National Capital Airports, Federal Aviation Agency. (Public Administration)
- PALLANSCH, MICHAEL J., (1955). Ph.D., Minnesota. Head, Concentrated Milk Investigations, Eastern Utilization Research Branch, Agricultural Research Service, USDA. Taught at Georgetown. (Physical Sciences)
- PAUL, LEE E., (1964). B.S., Michigan. Research Psychologist (Engineering), Systems Research and Development Service, Federal Aviation Agency. Taught at North Carolina and William and Mary. (FAA)
- PARKER, CARLYLE V., (1963). B.S. in E.E. and Engr. Phys., Michigan. Head, Security Systems and Aviation Branch, Electronics Division, Naval Research Laboratory, Department of the Navy. Taught at Maryland. (Technology)
- PAYNE, KIRBY B., (1960). M.S., Catholic. Assistant Director, Field and Special Services, National Agricultural Library, USDA. Taught at Drexel Institute of Technology. (Languages and Literature)
- PEDELTZ, MICHAEL J., (1962). M.S., Case Institute of Technology. Research Associate, American University. Taught at Case Institute. (Mathematics and Statistics)
- PEDRICK, ROBERT A., (1961). M.A., Johns Hopkins. Physical Oceanographer, Radios isotopic Oceanography Project Head, U. S. Naval Oceanographic Office, Department of the Navy. (Physical Sciences)
- PERLMAN, HERBERT L., (1959). LL.B., Columbia. Assistant to the Judicial Officer, Office of the Secretary, USDA. Taught at College of the City of New York. (Public Administration)
- PERLMUTTER, JEROME H., (1955). M.A., American. Chief, Division of Publishing and Reproduction Services, Department of State. (Committee on Publications and Languages and Literature)
- PERSIL, HERBERT G., (1962). Ph.D., Chicago. Budget Analyst, Office of Administration, Housing and Home Finance Agency. Taught at Loyola (Chicago Illinois). (Office Techniques)
- PETERSON, E. J., (1948). B.S., Wisconsin. Chief, Employee Development and Safety Branch, Personnel Division, Soil Conservation Service, USDA. (Committee on Correspondence Study and Extension Education and Technology)
- PETERSON, GERALD A., (1963). B.S., Wisconsin. Meteorologist (Forecast Analyst), Office of Forecast Improvement, U. S. Weather Bureau, Department of Commerce. Taught at Chautau Air Force Base. (Illinois). (Physical Sciences)
- PHILLO, ROBERT S., (1964). B.S., Wisconsin. Chief, Employee Development Section, Personnel Management Branch, National Institutes of Health, Department of Health, Education, and Welfare. (Special Program)
- PHILLIPS, HIRAM S., (1963). B.A., Cornell. Deputy Director, Office of Institutional Development, Bureau for Latin America, Agency for International Development, Department of State. (Public Administration)
- PIERSON, ROBERT M., (1963). Ph.D., Duke. Humanities Librarian, University of Maryland. Taught at Maryland and Ohio State. (Languages and Literature)
- PIKE, HOWLAND, (1950). Government Sales, Ansco Division, General Aniline and Film Corporation. (Technology)
- PILSON, T. ALFRED, (1960). LL.B., George Washington. Procurement Specialist, Defense Communications Agency, Department of Defense. Taught at George Washington. (Public Administration)
- PINES, J. ARNOLD, (1963). B.S., Rutgers. Chief Financial Analyst, Division of Corporate Regulation, Securities and Exchange Commission. Taught at Catholic and Columbus School of Accountancy. (Social Sciences)
- PIQUET, HOWARD S., (1939). Ph.D., Princeton. Senior Specialist in International Economics, Legislative Reference Service, Library of Congress. Taught at American, California, New York, Oregon, Princeton, and Washington. (Social Sciences)
- PISTRANG, MARVIN A., (1962). B.S., College of the City of New York. Geologist, U. S. Geological Survey, Department of the Interior, President, Audubon Naturalist Society of Central Atlantic States, Inc. Taught at Northwestern. (Biological Sciences)
- PLAIT, ALAN O., (1963). B.S., Illinois Institute of Technology. Supervisor, Reliability Engineering, Melpar, Inc. Taught at Illinois Institute of Technology. (Mathematics and Statistics and Technology)
- POLLOCK, ROSS, (1946). M.A., George Washington. Assistant Director, Office of Career Development, Civil Service Commission. Taught at George Washington. (Public Administration)
- POPE, WILLIAM C., (1960). B.S. in I.E., Northeastern. Registered Professional Engineer, District of Columbia. Chief, Branch of Safety Management, Division of Personnel Management, Office of Administrative Assistant Secretary, Department of the Interior. Taught at South American Universities. (Public Administration)
- POPECKI, JOSEPH T., (1952). B.S. in L.S., Catholic. Assistant Director of Libraries, Catholic University. (Languages and Literature)
- PRICE, H. WALTER, (1953). B.S., Drexel Institute of Technology. Chief, Reliability Branch, Harry Diamond Laboratory. (Technology)
- PRICHARD, JAMES W., (1961). B.A., Yale. General Supply Officer, Inventory Control Division, Bureau of Supplies and Accounts, Department of the Navy. (Public Administration)
- PRITZER, DOROTHY F., (1956). B.A., Kentucky. Formerly Employee Development Officer, Bureau of the Census, Department of Commerce. (Languages and Literature)
- PRITZER, LEON, (1959). M.A., Pennsylvania. Chief, Response Research Branch, Statistical Research Division, Bureau of the Census, Department of Commerce. Taught at Case Institute of Technology. (Mathematics and Statistics)
- PURDY, ELBRIDGE C., (1943). Master of Photography. Division of Photography, Office of Information, USDA. *Retired.* (Technology)
- RAFF, MORTON S., (1961). M.A., American. Mathematical Statistician, Division of Statistical Standards, Bureau of Labor Statistics, Department of Labor. Taught at Johns Hopkins. (Mathematics and Statistics)
- RAMSAY, MAYNARD J., (1956). Ph.D., Cornell. Plant Quarantine Inspector (Training-Entomology), Division Training Center, Plant Quarantine Division, Agricultural Research Service, USDA. Taught at Buffalo, Cornell, and Millard Fillmore. (Biological Sciences)
- RANKIN, WILLIAM J., (1959). Photographer. Soil Conservation Service, USDA. (Technology)
- RAPP, WILLIAM F., (1958). B.A., Loyola (California). Director, Office of Management and Organization, Department of Commerce. (Public Administration)
- RASMUSSEN, WAYNE D., (1950). Ph.D., George Washington. Agricultural Historian, Economic Research Service, USDA. (Public Administration and Correspondence)
- RAUSCHER, CHARLES B., (1963). Chief, Training Branch, Food and Drug Administration, Department of Health, Education, and Welfare. (Committee on Correspondence Study and Extension Education)
- REED, ROBERT C., (1960). M.A., Bowling Green. Assistant, University of Maryland. Taught at Bowling Green and George Washington. (Languages and Literature and Correspondence)
- REEVES, GEORGE T., JR., (1963). M.B.A., Indiana. Director, Training Division, Internal Revenue Service. Department of the Treasury. (Committee on Correspondence Study and Extension Education)
- REICH, DAVID, (1946). LL.B., Fordham. Attorney at Law. (Public Administration)
- REID, MAX P., (1957). B.S., Utah State Agricultural College. Deputy Director, Office of Personnel, USDA. (Office Techniques and Public Administration)
- REINGOLD, NATHAN, (1963). Ph.D., Pennsylvania. Senior Research Specialist, Science and Technology Division, Library of Congress. Taught at Yale. (Physical Sciences)
- REYNOLDS, JAMES E., (1961). B.A., George Washington. Chief, Marketing Research Branch, Marketing Information Division, Agricultural Marketing Service. (Languages and Literature)
- REZNIKOFF, DAVID, (1959). College of the City of New York. Planner, Government Printing Office. (Technology)



- RICE, WILLIAM B., (1952). Director of Administration, Office of Emergency Planning, Executive Office of the President. (Office Techniques)
- RICHMAN, ERNEST, (1960). M.S., Columbia. Plant Quarantine Inspector (Training), Division Training Center, Plant Quarantine Division, Agricultural Research Service, USDA. (Biological Sciences)
- RIXSE, JOHN H., JR., (1958). B.S. in E.E., George Washington. Registered Professional Engineer. Chief, Power System Engineering Branch, Rural Electrification Administration, USDA. Taught at Virginia.
- ROBIN, EDWARD A., (1962). M.S. in E.E., New York. Senior Systems Engineer, Bunker Ramo Corporation, Canoga Park, California. Taught at Miami. (FAA)
- ROBINSON, BENJAMIN F., (1963). B.S., Indiana. Assistant Inspector General, Analysis and Evaluation, Office of Inspector General, USDA. (Committee on Internal Audit and Public Administration)
- RODBELL, OSCAR, (1956). Chief, Color Photographic Branch, Armed Forces Institute of Pathology, Walter Reed Army Medical Center. (Technology)
- RODE, ALEX., (1963). B.A., George Washington. Headmaster, The Walden School. Taught at Cambridge School (New York City), Colorado Academy (Denver), Hawthorne School (Washington, D. C.), and George Washington. (Social Sciences)
- ROGERS, JOSEPH B., (1960). M.S., Washington State. Personnel Management Specialist, Personnel Division, Soil Conservation Service, USDA. (Correspondence)
- ROJKO, ANTHONY S., (1959). M.S., Connecticut. Economic and Statistical Analysis Division, Economic Research Service, USDA. Taught at Connecticut. (Mathematics and Statistics)
- ROSENZWEIG, BENJAMIN, (1951). B.S. in Ch.E., College of the City of New York. Chief, Technical Data Branch, Defense Supply Agency, Department of Defense. (Technology)
- ROWE, HAROLD B., (1947). B.S., Iowa State. Member, Senior Staff, The Brookings Institution. *Retired*. Taught at Massachusetts and Minnesota. (Social Sciences)
- RUPPERT, M. CLARE, (1947). M.A., George Washington. Coordinator, Adult Services, D. C. Public Library. (Committee on Academic Excellence and Languages and Literature)
- RUSSELL, CARL M., (1961). M.S. in E.E., Maryland. Chief, Traffic Control Research Branch, Systems Research and Development Service, Federal Aviation Agency. Taught at Maryland. (FAA)
- RYAN, WALTER F., (1953). Ph.D., Cornell. Deputy Chief, Office of Statistical Standards, Bureau of the Budget. (Mathematics and Statistics)
- SAATY, THOMAS L., (1954). Ph.D., Yale. Research Mathematician, Arms Control and Disarmament Agency. Author and Lecturer. Consultant on national planning to Ford Foundation. Taught at American, Catholic, and George Washington. (Mathematics and Statistics)
- SANBURN, WESLEY E., (1964). B.A., Florida. Research Mathematician, Photogrammetry Division, Engineer, Geodesy, Intelligence, and Mapping Research and Development Agency, U. S. Army Engineers. (Technology)
- SAPP, CARL R., (1962). M.A., American. Chief, Division of Legislative Reporting, Office of Budget and Finance, USDA. (Public Administration)
- SARBAUGH, LAWRENCE E., (1964). M.S., Illinois. Public Information Specialist, Publications Research, Publications Division, Office of Information, USDA. Taught at Illinois. (Languages and Literature)
- SATHE, YASHAWANT, (1964). Ph.D., North Carolina. Visiting Associate, Experimental Statistics Section, National Cancer Institute, National Institutes of Health, Department of Health, Education, and Welfare. Taught at National Institutes of Health. (Mathematics and Statistics)
- SAWCHUCK, HENRY A., (1949). M.S., College of the City of New York. Emergency Planning Engineer, Office of Engineering, Bureau of Public Roads, Department of Commerce. (Technology)
- SCALA, THEODORE, (1961). M.A., Theological Academy, Bessarabia (Rumania). Instructor in Russian. Taught at Department of Education, Boston (Massachusetts) and Omaha. (Languages and Literature)
- SCHAAI, WILBERT, (1956). B.S., Ohio State. Agricultural Trade Promotion Specialist, Foreign Agricultural Service, USDA. (Languages and Literature and Correspondence)
- SCHAEZNER, J. P., (1949). B.S., Wisconsin. Agricultural Engineer, Electric Distribution Division, Rural Electrification Administration, USDA. Taught at Wisconsin. *Retired*. (Technology)
- SCHERSCHEL, FRANK J., (1964). Photographic Laboratory, U. S. Information Agency. Taught at Kent State, Michigan State, and North Carolina. (Technology)
- SCHNEIDER, SIDNEY, (1955). B.A., Brooklyn. Supervisory Budget Administration Officer, General Services Administration. Lectured at George Washington. (Public Administration)
- SCHULE, JOHN J., JR., (1954). B.A., St. John's (New York). Division Director, Oceanographic Prediction Division, U. S. Naval Oceanographic Office, Department of the Navy. Taught at New York. (Physical Sciences)
- SCHULKIN, MORRIS, (1960). M.S., George Washington. Advisory Engineer, Westinghouse Electric Corporation. Taught at Drexel Institute of Technology and George Washington. (Physical Sciences)
- SCHULMAN, FRED, (1957). Ph.D., Georgetown. Chief, Nuclear Electric Power Systems. National Aeronautics and Space Administration. Taught at Pearl Harbor Training School and Virginia Polytechnic. (Technology)
- SCHULTHEIS, HENRY, (1955). B.S., in Lands. Arch., Cornell. Construction Management Engineer, Office of Chief of Engineers, Department of the Army. Professional Landscape Architect. (Technology)
- SCHWARTZ, M. H., (1959). B.A., Illinois. Director, Division of Data Processing, Federal Reserve Board. (Mathematics and Statistics)
- SCOTT, JOHN W., (1957). B.S., Texas A. and M. Assistant Administrator-Operations, Rural Electrification Administration, USDA. (Correspondence)
- SEARL, MILTON F., (1964). B.S., Illinois Institute of Technology. Chief, Economics Branch, Division of Operations Analysis and Forecasting, U. S. Atomic Energy Commission. Taught at Illinois Institute of Technology and U. S. Navy Sonar School. (Technology)
- SECRET, ELIZABETH D., (1962). B.A., Colorado College. Management Analyst, Internal Revenue Service, Department of the Treasury. (Correspondence)
- SELLERS, ASHLEY, (1941). S.J.D., Harvard. Attorney at Law. Taught at Emory and Georgia. (Public Administration)
- SHAPIRO, HARVEY, (1962). Ph.D., Wisconsin. Fiscal and Financial Economist, Economic Research Service, USDA. Taught at Iowa State and Wisconsin. (Social Sciences)
- SHERROD, JOHN, (1958). M.S., Pennsylvania State. Chief, Information Services and Systems Branch, U. S. Atomic Energy Commission. Taught at Pennsylvania State. (Languages and Literature)
- SHETLER, STANWYN G., (1963). M.S., Cornell. Associate Curator of Phanerogams, Division of Phanerogams, Department of Botany, Smithsonian Institution. Taught at Cornell and Michigan. (Biological Sciences)
- SHIRAKAWA, HAROLD S., (1963). Ph.D., Notre Dame. Plant Quarantine Inspector (Training Officer-Phytopathology), Division Training Center, Plant Quarantine Division, Agricultural Research Service, USDA. Yale-Bishop Museum Fellow. Taught at Hawaii and Notre Dame. (Biological Sciences)
- SHORTRIDGE, JOHN, (1963). M. M., Indiana. Harpsichord Maker and formerly Associate Curator of Cultural History, Smithsonian Institution. Taught at Chama (New Mexico) Schools. (Technology)
- SHOUB, EARLE P., (1963). B.S., Polytechnic Institute of Brooklyn. Chief, Division of Accident Prevention and Health, U. S. Bureau of Mines, Department of the Interior. Taught at Pittsburgh. (Public Administration)
- SEGEL, JACOB S., (1949). M.A., Pennsylvania. Chief, National Population Estimates and Projections Branch, Population Division, Bureau of the Census, Department of Commerce. Taught at Chile (Santiago). (Mathematics and Statistics and Social Sciences)
- SILVERSTEIN, ARTHUR M., (1959). Ph.D., Rensselaer. Immunobiology Branch, Armed Forces Institute of Pathology. (Biological Sciences)
- SIMMONS, WALT R., (1957). M.A., Kansas. Statistical Advisor, Department of Health, Education, and Welfare. Taught at American and Kansas. (Mathematics and Statistics)

- SIMMS, D. HARPER, (1952). B.A., B.J., Missouri. Director, Information Division, Soil Conservation Service, USDA. (Committee on Publications)
- SIMONSON, ROY W., (1959). Ph.D., Wisconsin. Director, Soil Classification and Correlation, Soil Conservation Service, USDA. Taught at Iowa State. (Physical Sciences)
- SINGLETON, CAREY B., JR., (1961). M.A., American and Maryland. Agricultural Economist, International Regional Analysis Division, Economic Research Service, USDA. Taught at Southeastern and Virginia. (Social Sciences)
- SLINGLUFF, BENJAMIN F., (1964). B.S. in E.E., Drexel Institute of Technology. Engineer, Potomac Electric Power Company Taught at George Washington. (Technology)
- SLONIM, CHARLES E., (1964). Nav. E., Massachusetts Institute of Technology. Head, Submarine Section, Ship Installation and Design Branch, Special Projects, Department of the Navy. Taught at Valjeo Jr. (Mathematics and Statistics)
- SMITH, ALBERT E., (1964). M.A., Illinois. Civilian Head, Computer Systems and Applications Branch, Bureau of Ships, Department of the Navy. Taught at Illinois Public Schools and U. S. Navy. (Physical Sciences)
- SMITH, ROBERT S., (1964). Ph.D., Illinois. Operations Analyst, Research Analysis Corporation. Taught at Illinois. (Technology)
- SNYDER, F. F., (1932). B.C.E., Ohio State. Hydraulic Engineer, Corps of Engineers, Department of the Army. (Technology)
- SODERSTROM, THOMAS R., (1962). Ph.D., Yale. Associate Curator, Department of Botany, Smithsonian Institution. Taught at Yale. (Biological Sciences)
- SOKOL, SIDNEY S., (1963). M.B.A., College of the City of New York. C.P.A. Assistant Commissioner of Accounts, Bureau of Accounts, Department of the Treasury. (Public Administration)
- SOMMERVILLE, MARIE-THÉRÈSE J., (1961). LL.B., Paris. Head, French Department, Language Institute-East Branch, Department of Defense. Taught at George Washington and Pomona. (Languages and Literature)
- SOUTHARD, RUPERT B., JR., (1957). B.C.E., Syracuse. Civil Engineer, Chief, Office of International Activities, Topographic Division, U. S. Geological Survey, Department of the Interior. (Technology)
- SPENCER, FRANK H., (1949). Deputy Administrator, Administrative Management, Agricultural Research Service, USDA. (Office Techniques and Public Administration)
- STAMMEYER, EUGENE, (1958). Ph.D., Catholic. Supervisory Psychologist, Psychology Branch, St. Elizabeths Hospital, Department of Health, Education, and Welfare. Taught at Catholic, George Washington, and Loras. (Social Sciences)
- STARKEY, JAMES H., (1950). B.S., Virginia Polytechnic. Assistant Director of Science and Education, Agricultural Research Service, USDA. (Committee on Correspondence Study and Extension Education)
- STARNES, HENRY C., (1957). B.A., George Washington. Director, Personnel Management Division, Rural Electrification Administration, USDA. (Office Techniques and Correspondence)
- STATTON, C. D., (1963). B.S. in M.E., Iowa State. Project Engineer, Bechtel Corporation. (Technology)
- STAUBER, B. RALPH, (1931). M.A., Minnesota. Chief, Agricultural Price Statistics Branch, Statistical Reporting, USDA. Taught at Minnesota. (Mathematics and Statistics)
- STEARNS, JOSEPH L., (1957). M.S., College of the City of New York. Research Mathematician, U. S. Coast and Geodetic Survey, Department of Commerce. Taught at Virginia. (Mathematics and Statistics)
- STEELE, J. GORDON, (1942). Ph.D., Ohio State. Chief, Soil Survey Reports, Soil Conservation Service, USDA. (Correspondence)
- STEFFERUD, ALFRED D., (1960). B.A., St. Olaf. Publications Officer, Office of Information, USDA. Taught at South Dakota Public Schools. (Languages and Literature)
- STEINBERG, JOSEPH, (1942). B.S., College of the City of New York. Chief Mathematical Statistician, Division of Research and Statistics, Social Security Administration, Department of Health, Education, and Welfare. (Mathematics and Statistics)
- STEINBERG, ROBERT M., (1964). M.S., Massachusetts Institute of Technology. Economist, Division of Data Processing, Board of Governors, Federal Reserve Board. (Mathematics and Statistics)
- STEINHAEUER, ALLEN L., (1963). Ph.D., Oregon State. Assistant Professor of Entomology, University of Maryland. Taught at Maryland and Oregon State. (Biological Sciences)
- STEININGER, MARGARET A., (1958). Ray-Vogue School of Interior Decoration. Owner, Peggy's Showroom, Washington, D. C. (Technology)
- STEPHENS, EDMUND, (1952). M.S., Oregon State. Director, Program Examination and Budget Development Division, Agricultural Research Service, USDA. (Office Techniques)
- STERLING, MANUEL M., (1961). Doctor in Law and Social Sciences, Havana. Professor of Spanish. (Languages and Literature)
- STEVENS, HENRY, (1946). Ph.D., George Washington. Chief Biochemist, Allergens Laboratory, Eastern Utilization Research and Development Division, Agricultural Research Service, USDA. (Physical Sciences)
- STOCKARD, JAMES G., (1956). M.A., American. Chief, Public Administration Training Branch, Office of International Training Division, Agency for International Development, Department of State. (Public Administration)
- STOCKER, FREDERICK D., (1955). Ph.D., Cornell. Head, Farm Taxation and Rural Government Section, Farm Production Economics Division, Economic Research Service, USDA. Taught at Cornell and Lehigh. (Social Sciences)
- STOCKMANT, ROBERT L., (1961). Chief, Employee Development and Safety Branch, Personnel Division, Agricultural Research Service, USDA. (Committee on Academic Excellence)
- STONE, HAROLD A., (1946). M.S.P.A., Syracuse; M.E., Ohio State. Chief, Management Engineering Division, Office of the Comptroller of the Army, Department of the Army. (Public Administration)
- STOVER, JAMES H., (1957). Director, Office of Management and Organization, Office of Administrative Assistant Secretary, Department of the Treasury. (Public Administration)
- STRATTON, CHARLES J., (1964). M.C.S., Southeastern. Special Assistant, Financial Management Branch, National Institutes of Health, Department of Health, Education, and Welfare. (Mathematics and Statistics)
- SUTER, GLENN W., (1957). M.S., Virginia Polytechnic Institute. Head, Enumerative and Special Mailed Surveys Section, Field Operations Division, Statistical Reporting Service, USDA. Taught at Bridgewater and Shenandoah. (Mathematics and Statistics)
- SWINK, RICHARD M., (1963). Data Processing Writer and Instructor, Marine Corps Institute, U. S. Marine Corps. Taught at Military Installations. (Office Techniques)
- SYKES, JOSEPH F., (1950). Ph.D., Toronto. Chief, Dairy Cattle Research Branch, Animal Husbandry Research Division, Agricultural Research Service, USDA. Taught at Michigan State. (Agricultural Research Center Committee)
- TAEUBER, CONRAD F., (1953). Ph.D., Minnesota. Assistant Director, Bureau of the Census, Department of Commerce. Taught at Mount Holyoke. (Mathematics and Statistics and Social Sciences)
- TATE, ELIZABETH L., (1960). Ph.D., Chicago. Information Resources Analyst, National Referral Center for Science and Technology, Library of Congress. (Languages and Literature)
- TAYLOR, JOHN A., (1961). B.B.A., Massachusetts. Systems Engineer, Federal Systems Division, International Business Machines. (Mathematics and Statistics)
- TAYLOR, WILLIAM WILSON, (1961). South Carolina and Parsons School of Design. Artist. Taught at Ennis School of Painting, Eastport (Maine), Abbott Art School, and Columbia Technical Institute. (Technology)
- TERRY, NEWELL B., (1959). M.A., Kansas. Director of Personnel, Department of the Interior. Taught at Kansas Public Schools. (Public Administration)
- TEWELES, SIDNEY, (1945). Ph.D., Massachusetts Institute of Technology. Chief, Stratospheric Meteorology, Research Project, U. S. Weather Bureau, Department of Commerce. Taught at Chicago, Istanbul Technical University, and Pennsylvania State. (Physical Sciences)



- TEWINKEL, G. C., (1946). M.C.E., Syracuse. General Engineer, Office of Research and Development, U. S. Coast and Geodetic Survey, Department of Commerce. Taught at George Washington and Maryland. (Technology)
- THACKREY, FRANKLIN, (1950). M.S., Kansas State. Director, Marketing Information Division, Agricultural Marketing Service, USDA. (Languages and Literature)
- THOM, HERBERT C. S., (1942). M.S., George Washington. Chief Climatologist, Office of Climatology, U. S. Weather Bureau, Department of Commerce. Taught at Cornell, Iowa State, and Maryland. (Physical Sciences)
- THOMAS, ALMON D., (1950). B.S.E.E., Colorado. Hydraulic Engineer, Bureau of Power, Federal Power Commission. (Technology)
- THOMPSON, MURRAY, (1962). Ph.D., California. Director, Policy and Program Appraisal, Agricultural Stabilization and Conservation Service, USDA. Taught at California, Lehigh, Purdue, and Rice. (Social Sciences)
- THURSTON, JOHN H., (1943). Ph.D., Harvard. Staff Assistant, Office of the Deputy Administrator, State and County Operations, Agricultural Stabilization and Conservation Service, USDA. Taught at Northwestern. (Public Administration)
- TILLER, CARL W., (1946). M.A., Minnesota. Chief of Budget Methods, Office of Budget Review, Bureau of the Budget. (Public Administration)
- TITUS, JAMES W., (1963). M.S., Maryland. Consultant, Mechanical Engineering, Radar Division, Naval Research Laboratory, Department of the Navy. (Technology)
- TOLSON, WILEY W., (1962). Ph.D., Georgetown. Research Biochemist, Endocrine Section, Bureau of Scientific Research, Drug Pharmacology Branch, Food and Drug Administration. Taught at Butler Jr. College (Texas). (Physical Sciences)
- TRACEY, JOSHUA I., JR., (1960). Ph.D., Yale. Geologist, Regional Geology, U. S. Geological Survey, Department of the Interior. (Physical Sciences)
- TRELOGAN, HARRY C., (1948). Ph.D., Minnesota. Administrator, Statistical Reporting Service, USDA. Taught at Minnesota. (Special Program and Social Sciences)
- TRISLER, WILLIAM F., (1964). M.S. in E.E., U. S. Naval Postgraduate School. Project Engineer, Bureau of Ships, Department of the Navy. (Technology)
- TROTT, L., JOHN, JR., (1962). M.S., North Carolina. Teacher, Burgundy Farms Country Day School. Taught at George Washington. (Biological Sciences)
- TROTTNOW, MARCELLA E., (1962). B.A., State College of Iowa. Teacher, Montgomery Blair High School (Maryland). (Office Techniques)
- TSAO, LIONEL, (1961). M.A., Harvard. Fellow Royal Asiatic Society. Taught at Harvard. (Languages and Literature)
- ULREY, IVON W., (1962). Ph.D., Ohio State. Head, Transportation Economic Research, Economic Research Service, USDA. Taught at Ohio State. (Social Sciences)
- VALLIERES, VINCENT B., (1957). Office of Executive Vice President, Southern Railway System. Instructor, Department of the Army. (Office Techniques)
- VAN DERSAL, WILLIAM R., (1957). Ph.D., Pittsburgh. Assistant Administrator for Management, Soil Conservation Service, USDA. Taught at Pittsburgh. (Office Techniques, Public Administration, and Correspondence)
- VAUGHAN, JOHN W., (1957). C.P.A. Deputy Director, Fiscal Division, Agricultural Stabilization and Conservation Service, and Chief Accountant, Commodity Credit Corporation, USDA. (Committee on Internal Audit)
- VICAN, GEORGE, (1958). Docteur de l'Université de Paris (Sorbonne), Diplôme de l'Institut des Hautes Etudes Internationales de l'Université de Paris. Assistant Professor of Modern Languages, Georgetown University. Taught at George Washington, and Universidad Nacional Autónoma de Mexico. (Languages and Literature)
- VOGELY, WILLIAM A., (1954). Ph.D., Princeton. Chief Economist, U. S. Bureau of Mines, Department of the Interior. Taught at Kenyon. (Social Sciences)
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- WADLEY, F. M., (1939). Ph.D., Minnesota. Analytical Statistician in Biology, U. S. Army Chemical Corps, Department of the Army. Taught at Minnesota. (Correspondence)
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- WHITE, BENNETT S., JR., (1938). Ph.D., Harvard. Director, Economics Marketing and Rural Development Division, Cooperative State Research Service, USDA. Taught at George Washington, Kentucky, and Virginia. (Social Sciences)
- WHITE, ELMO J., (1955). Chief, Art and Graphics Division, Office of Information, USDA. (Committee on Information and Languages and Literature)
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- WILSON, EDWARD F., (1960). M.A., American. Deputy Assistant Administrator-Electric, Rural Electrification Administration, USDA, (Public Administration)



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- WRAY, ROBERT V., JR., (1960). B.S., Maryland. Cartography, Soil Conservation Service, USDA. (Technology)
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- WYLIE, CHARLES E., (1958). Attended Michigan State. Chief, Records Management Division, Plant and Operations, USDA. (Office Techniques)
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U. S. DEPARTMENT OF AGRICULTURE

Washington, D. C. 20250

**ADDRESS:** Room 1031, South Building, U. S. Department of Agriculture, 14th St. and Independence Ave., S. W., Washington, D. C., 20250.

**OFFICE HOURS:** 9:00 A.M.-6:15 P.M., Monday through Friday.

**TELEPHONE:** Dudley 8-6337.

**CLASSES:** Most classes meet in the evening. For the exact time, see the supplement for each semester, *Schedule of Classes*.

**CLASSROOMS:** Classroom assignment are given to the student at the time of registration.

**BOOKSTORE:** Textbooks can be purchased at the Graduate School bookstore, Room 1023, South Building, U. S. Department of Agriculture. See *Schedule of Classes* for hours.

